Rock Products
With which is Incorporated CEMENT and ENGINEERING NEWS
Founded 1896

Volume XXXIV | Chicago, November 7, 1931 | Number 23

New Crushing Plant Includes Ready-Mixed Concrete Plant

Francey Stone and Supply Co., Wauwatosa, Wis., Develops New Partnership with Concrete Company

By H. M. Fitch
College of Engineering, University of Illinois

IN THIS AGE OF SPECIALIZATION it is not unusual to find plants in the crushed stone field designed for particular purposes, such as the production of a certain type of road stone, or possibly for the exclusive production of agricultural limestone. It has remained, however, for one Wisconsin producer to be the leader in designing a plant to operate in conjunction with a central concrete mixing plant so that each operation is a complement to the other. The crushing plant, of course, does not produce stone exclusively for the mixing operation, but the whole design was worked out with the idea that the crusher could furnish all the coarse aggregate that the mixer needed with a minimum of delay, lost motion and expense.

The quarry of the Francey Stone and Supply Co. has been producing stone within the city limits of Wauwatosa, a suburb of Milwaukee, for many years. It was formerly operated under the name of the G. D. Francey Coal Stone and Supply Co., but about a year ago the company was reorganized and T. D. Francey, a nephew of G. D. Francey, took it over and is now operating it as president. Within the year a new plant has been built and placed in operation. A complete concrete mixing plant has been included in the design of the new plant and is now being operated by a separate company, the Certified Concrete Co.

View of plant from hill above quarry. Ramp and primary crusher house in foreground and screen house and concrete mixing plant beyond at left

In laying out the new plant the company had a number of factors to consider which the ordinary plant does not have to take into account. Chief of these was the fact that because the quarry was located within the city limits of Wauwatosa, large scale quarry operations, particularly heavy blasting, were impossible. Competition with large operations using the most efficient quarrying methods was thus out of the question as far as shipping large quantities of stone was concerned. On the other hand, the quarry is located so close to the Milwaukee metropolitan area that it can serve this district easily, quickly and well. Hence the plant was designed

practically for local distribution of the products and the idea of service to local customers was uppermost in the minds of the men who planned it. Distribution of ready-mixed concrete being one useful way in which the producer can serve the consumer, it was only logical to make provision for such a mixing unit in the new layout.

Quarry Operation

The company controls about 20 acres of land, all underlain with a good grade of limestone. The quarry has been opened up in the hill back of the plant, so that although the floor is only about 40 ft. below ground level at the plant, the face on the far side is about 90 ft. in height. The overburden varies considerably but will average about 10 ft. in depth. It is removed by a contractor who uses the dirt for fills on other jobs, and the cost of stripping is thus materially reduced. The upper deposit is a bed of tough brownish limestone, appearing slightly weathered, but showing a very good strength in tests. In fact, in some concrete work this particular stone is preferred to the tougher greyish stone below because the latter breaks in smooth pieces, while the brownish stone breaks more roughlyand provides a better bond in concrete. This upper bed extends downward for about 30 ft. and beneath is a hard bed of tough grey stone. Generally the company has not attempted to separate the two kinds of stone as they are quarried, but this can be done if one or the other is particularly desired by a custamer.

When the new plant started up last spring five holes were drilled and shot at one time, but because of complaints from nearby residents this has been cut down to two holes at one shot. The bench method of quarrying is used, and as a "safety first" precaution all men working up on the face must have a rope fastened around the waist with the other end securely fastened above. Ingersoll-Rand type S-59 "Jackhamer" drills are used for making the blast holes and each hole is loaded with about 8½ lb. of Du Pont 60% powder. The company would prefer to use 40% explosive in order to reduce the amount of shattering, but an equal charge of the latter would fill the hole so near the top that there would be danger of its blowing out and causing trouble in that way. There is a tendency to produce too much fines in the quarrying, and although these are sold to cement products plants in the vicinity, it lowers the efficiency of the plant. To further eliminate danger from the quarrying operation no secondary shooting is done and the large pieces are broken by dropping a heavy iron ball on them from the dipper of the shovel. This does away with block holing and mud-capping, two practices which are likely to throw stones.

General view of quarry with ramp to crusher at right

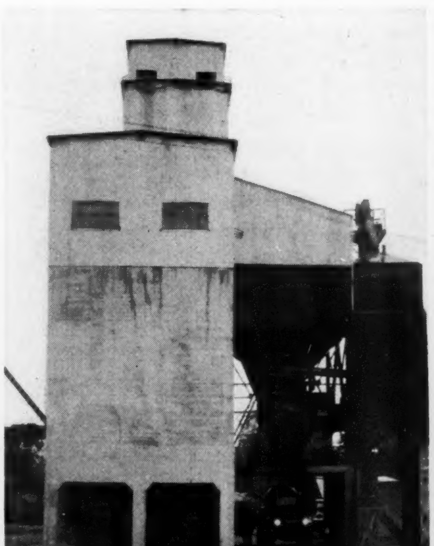
Trucks Used in Quarry

Loading of the rock in the quarry is done with a 1¼-yd. electric Koehring shovel which was installed new this year and by a P. and H. 1-yd. electric shovel, which is used as an auxiliary. The stone is loaded to trucks and carried by them to the primary crusher which is located in the quarry. The use of trucks in the quarry is another innovation introduced by T. D. Francey.

Formerly cars were used which went by gravity to the incline and were drawn back to the shovel by a horse. From the foot of the incline the cars were pulled up to the primary crusher which was then at ground level. Now the primary crusher house stands a little above the quarry floor and directly below the main plant. A wooden incline was built from the quarry floor up to the primary crusher and a shorter return road was cut in the rock beyond the crusher house and leading back down into the quarry. The wooden trestle is on a grade of 10%, while the return grade is 15% at some points. The floor of the quarry was also leveled and smoothed off to facilitate truck movements.

In operation, a truck is loaded at the shovel, passes up the 10% grade and backs to the primary crusher house. After dumping, it pulls out from the crusher house in a straight line and passes on down the other road to the quarry floor. In this way there is no interference of the trucks no matter how many are in operation at one time. For most efficient operation the plant could keep two trucks busy in the quarry and would be turning out as much as 800 yd. of crushed material daily. However, recent conditions have not warranted this production and a single truck has been used in the quarry most of the time. With one

Screen house and bins with mixing unit at left



View of bins and mixing plant from opposite end

Truck being loaded by electric shovel

Truck dumping to primary crusher

truck in operation the plant is now turning out about 350 yd. per day, but it is found that the crushers and screening equipment are idle about one-half of the time.

Six yard trucks are used with the end gate removed, as it would be impractical to use the end gate because some of the pieces of stone loaded by the shovel are too large to readily pass under it. A Mack and a Sterling truck are available for the quarry hauling. Although no cost records are available as yet for a comparison with the former horse-drawn operation, the company feels that the installation has been a success because of increased speed, flexibility and efficiency. The whole quarrying operation is now carried on by five men, consisting of two drillers, a shovel operator, a truck driver and a clean-up man.

The quarry is kept dry normally by a 300 g.p.m. Allis-Chalmers centrifugal pump operating from a sump beside the crusher house. A 1200 g.p.m. Allis-Chalmers pump is also installed as a stand-by, but there is rarely enough water to make its use necessary. Incidentally, the lower portion of the crusher house, which is really a pit in which the secondary crusher is located, is below water level so that during construction it was necessary to have a small pump at work in the pit constantly from the time the cement was poured until it set. This portion is now a solid concrete tank holding the water out from the crushing equipment.

Crusher House

The building housing the crushing equipment is a three-story wood structure above

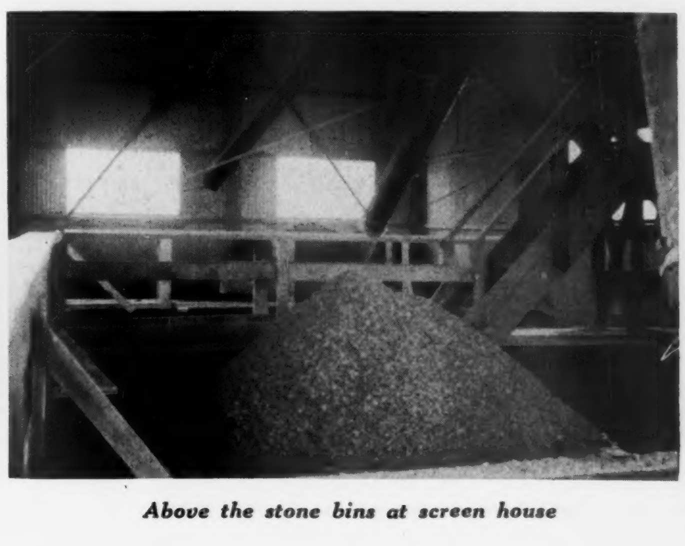
Primary crusher

the pit containing the secondary crusher. It is arranged with a steel I-beam frame and a 16-ton Chisholm Moore Cyclone chain hoist for handling machinery parts. The trucks back directly up to the primary crusher, which is a No. 12 Allis-Chalmers style N gyratory. From this unit the stone discharges to a 3-ft. by 8-ft. Allis-Chalmers centrifugal vibrating scalping screen from which the throughs fall to a conveyor and are taken up to the screening plant, while the rejects pass to the secondary crushing unit. This is a 7-in. Newhouse Allis-Chalmers crusher, and its discharge also falls to the conveyor.

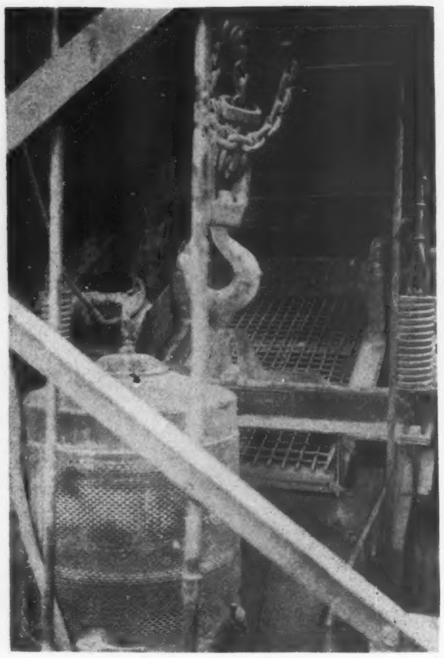
The 24-in. belt conveyor leading up from the crusher house is totally enclosed with sheet metal siding over a steel frame, and is driven at the head end by a 25-hp. General Electric motor through a Texrope drive. The conveyor discharges to a second 24-in. conveyor which takes the stone up to the screening plant through a second enclosed structure. The latter structure, however, is also equipped with a second belt which takes material from three hoppers at the ground level and carries it to the top of the plant. This belt, which is 18 in. wide, is used principally to take sand from the hoppers up to the mixing plant.

The structure housing the hoppers at the foot of this conveyor is of concrete and is on the edge of the quarry so that a minimum amount of excavating was necessary to get the hoppers below the ground level. Sand from the plant of the State Washed Sand and Gravel Co. is brought by the company's trucks and dumped directly to the hoppers and is then carried up on the conveyor as needed. It is also possible to dump reclaimed material from the storage yard to the plant conveyors at this point so that it may be taken up to refill the mixer bins while the plant is not operating. These ground level hoppers are covered with a sheet metal enclosure and fitted with sliding doors across the front.

Concrete bins at ground level



Above the stone bins at screen house



Vibrating scalping screen and top of secondary crusher

Screening Plant

The main plant is a fireproof concrete structure measuring 25 ft. by 65 ft., which contains 10 bins arranged in two rows of five in each row. Above the bins the screening equipment is supported on a steel framework covered with "Milcor" corrugated metal siding. The plant was started in February, 1931, and completed in four months, the work being done entirely by the Francey company except for the steel erection which was done by the Milwaukee Structural Steel Co. When the bins were poured the company did a real day's work by pouring everything from the floor to the top in a single day. A standard paver was used to mix the concrete and a tower was employed to raise it to the required height. The plant was designed by the Boehck Machinery Co. of Milwaukee. New equipment was used throughout with the exception of the primary crusher, which was removed from its former location and set up in the new crusher house.

The parallel belts from the ground hoppers are driven at the head end by a pair of General Electric motors, a 25-hp. motor operating the small belt and a 30-hp. motor driving the 24-in. belt. These conveyors and the 24-in. conveyor from the crusher house to the ground bins were made by the Northern Conveyor and Manufacturing Co.

The sand from the 18-in. belt is discharged either to the first pair of bins or to the sand bin at the mixing plant. The 24-in. belt delivers the stone to an Allis-Chalmers triple deck vibrating sizing screen where four sizes are separated out to the other four pairs of bins. The fines passing through the bottom deck are chuted to the second pair of bins, while the next pair of bins receives the ¾-in. material which passes through the middle deck and over the lower deck. The fourth pair of bins receives the 1½-in. size, while the oversize, which will run up around 2½-in. in size, goes to the last two bins. The chutes are all 10-in. diam. iron pipe and can be swung to fill either bin of the pair. There is plenty of head room about the plant, and the space above the bins is light and open, a distinct advantage for safe and efficient operation.

The bins are supported on concrete columns with ample space for truck loading underneath. All shipments are made by truck. Loading is done by means of roller-bearing gates designed by the Boehck Machinery Co., and these have operated very satisfactorily, according to the plant superintendent.

Some stockpiling is done in the yard alongside the plant, using trucks and a P. and H. crane for this work. Two Barber-Greene loaders are used for reclaiming.

Ready-Mix Plant

Beside the plant, and built integrally with it, is the concrete mixing unit. This is of steel on a concrete foundation. As yet only the top part above the bins is enclosed with corrugated sheet metal, but it is the intention to enclose the whole structure this winter when the men will have more time for the work.

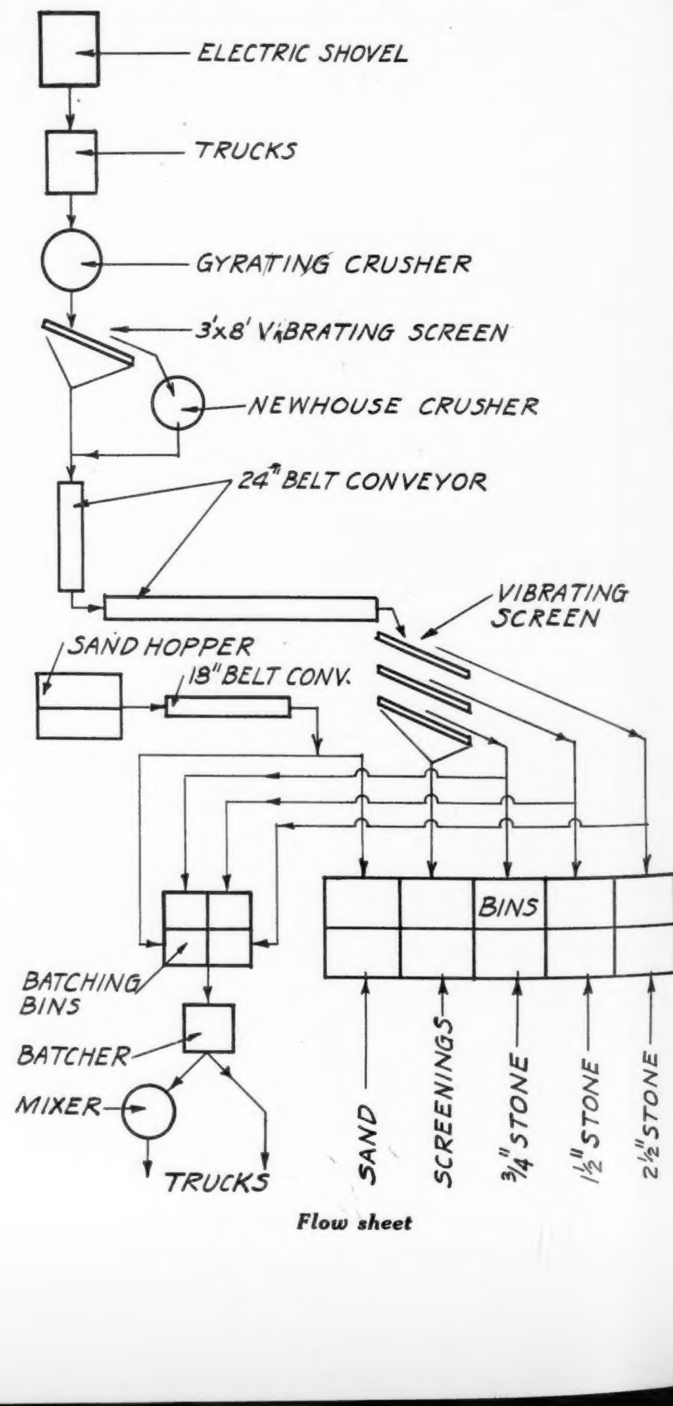
The steel material bin alongside the stone plant is divided into four compartments to hold sand, ¾-in. stone, 1½-in. stone and 2½-in. stone. Beyond this is the bin for the bulk cement.

Below the material bin is a large Smith batcher equipped with a "Weigh-Mix" attachment. From this batcher the weighed material can be delivered either to trucks as batched material or chuted to a 2-yd. tilting Smith mixer. A driveway extending through beneath the batcher and mixer permits of trucks receiving the batch without backing. Cement is brought to the plant in bulk by trucks and is delivered to a ground hopper below the cement storage bin. From this it is carried up to the overhead enclose bin by a Caldwell bucket elevator. The entire mixing plant is operated by one man, unless there is an extra amount of work, when a helper is added. Crushed screenings from the quarry are never used in the ready-mixed concrete, but are sold to cement products plants near by, who prefer to use them because of the light colored blocks they produce.

The company owns and operates six Mack trucks, each equipped with a Rex Motor-Mixer for agitating the mix on the trip from the plant to the job. These truck bodies were furnished by the Chain-Belt Co.

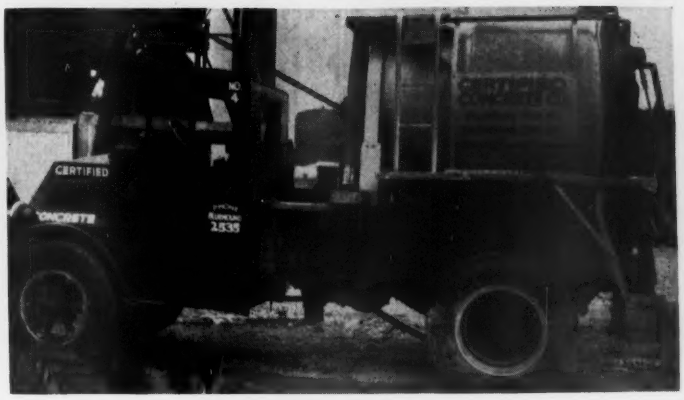
Power Plant

The company produces its own electric power which is generated by two 200-hp. Fairbanks-Morse Diesel engines direct connected to Fairbanks-Morse alternators. These furnish 3-phase current at 440 volts, which is used at all times except when it is desired to operate the mixer only, when outside current is purchased to save the expense of



Flow sheet

Below the loading bins



One of the agitator trucks

operating the generating equipment. A heat exchanger and water softener tank for the cooling water is used in connection with cooling the Diesel engines.

Located in the power house are two Ingersoll-Rand compressors, one of 400 and the other of 150 c.f.m. capacity, which supply air for the quarry drilling. They are driven by a 75-hp. General Electric synchronous motor. Besides the power units and the compressors, there is also a blacksmith shop in another room which contains an Ingersoll-Rand drill sharpener and Air Reduction Co. welding equipment, as well as an oil burner and copper tube boiler for heating water for winter operation of the mixing plant.

The quarry company owns three Sterling trucks, two Mack trucks and one Ford truck, so that with the six owned by the mixer company there is scarcely garage room enough to accommodate all. However, the company plans to construct a garage on the property during the coming winter months when work in the quarry is slack. At present the plans are to build a 75-ft. and 150-ft. garage facing on the street in front of the plant and to use part of the building for offices.

The company expects to operate through the coming winter except when the weather is too bad to permit quarry work, but even then the employes will be kept busy, as there is considerable cleaning up to be done following the construction of the new plant, and this is being left until the regular employes have time to do it. The men will also be used in the construction of the garage and office building. During the winter operation the material will be mostly stockpiled to build up a supply for the expected spring demand.

The plant is located on the main line of the Chicago, Milwaukee, St. Paul and Pacific railroad, with a siding in to the property, but this is used chiefly for bringing in material, as no shipping of stone is contemplated. For truck shipping, the plant is located on a country trunk highway connecting Wauwatosa and Milwaukee so that it has a quick direct entrance to the city.

In operating the plant only six men are used outside of the quarry, while two more are used on the crushers and five in the quarry. In the plant itself one man above the bins takes care of the screening and one below, the loading. The engineer takes care of the power house and is assisted by a maintenance man. A garage man is in charge of the trucks, and lastly there is a crane operator for stockpiling and reclaiming.

Another view of bins and screen house

Organization

T. D. Francey is president of the Francey Co. and treasurer of the Certified Concrete Co. S. L. Fuller, who was formerly engaged in contracting, is president of the Concrete company.

Mr. Francey has been connected with the organization for many years, although for awhile he left to operate the State Washed Sand and Gravel Co. When the reorganization was brought about a year ago he sold his interests in the sand company and returned to his former company. Having been in touch with two of the main branches of the rock products industry, his intention to become connected with a ready-mixed concrete business is especially interesting. C. C. Morgan has been superintendent for Mr. Francey since the new plant was commenced last February.

Pavement Finance for Cities

METHODS OF FINANCING city pavements are being studied by the city officials' division of the American Road Builders' Association, according to A. Harrington Place, engineer, Detroit Bureau of Governmental Research, who is chairman of the committee.

What portion of the cost of a pavement should be borne by the general public in initial pavement, repavement, resurfacing, and source of revenue from which to pay the general public's portion of this cost?

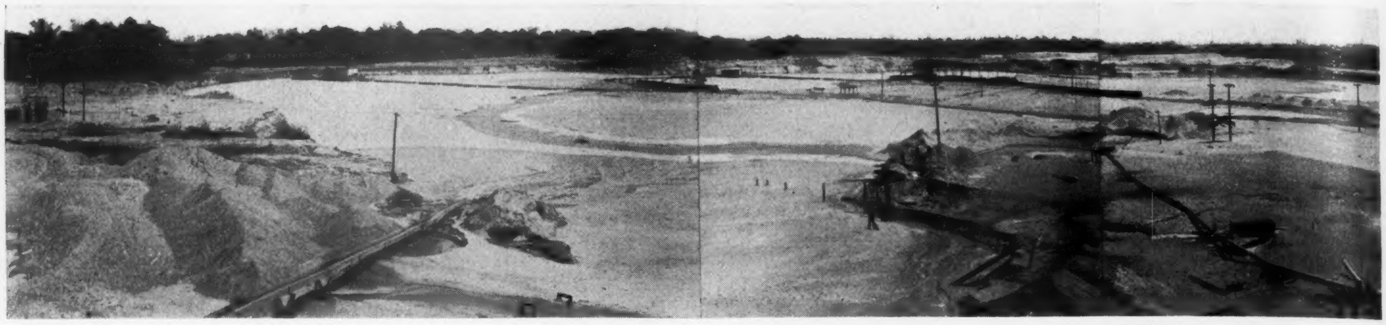
On no other question relative to the financing of pavements does there exist a wider divergence of opinion and practice among city officials. A carefully selected committee will, at the time of the convention, have spent months on a thorough investigation of this subject and will submit definite conclusions supported by authoritative data as to the solution of this problem.

After three years of materially lowered volume of street paving construction it is hoped this investigation may develop data that will be valuable in assisting to again develop this work to its proper position in construction.

Adds Third Ready-Mixed Concrete Plant

THE Cincinnati Builders Supply Co., Cincinnati, Ohio, has opened its third ready-mixed plant. It is near the downtown business district at its Hunt Street yard.

The plant consists of a large storage bin divided in four compartments. A circular bulk cement bin is also included in the plant. Fuller-Kinyon equipment is used in handling the bulk cement. Steam pipes in the bins provide means of heating the aggregate. Aggregates are combined through a 4-cu. yd. Blaw-Knox aggregate batcher equipped with a Howe 4-beam scale of 35,000 lb. capacity. Mixing and delivery of the concrete are by means of 17 Jaeger truck mixers, 15 of $2\frac{1}{2}$ cu. yd. capacity and two of $1\frac{1}{2}$ cu. yd. capacity.



Gifford-Hill and Co. operations at Forest Hill, La.

Sand and Gravel Industry Near Alexandria, Louisiana

By Walter B. Lenhart
Associate Editor, Rock Products

PLANTS without storage bins, in which scrubbers are a very important part of the equipment; Pump dredges operating on gravel banks that have to be blasted down with dynamite; Standard-gage tracks and 40- to 60-ton locomotives for loading and switching operations; Diesel engines for power largely used.

WITHOUT exception the dozen or more new plants built in the Southern States this year were put up by established and experienced producers. The expansion has been from within the industry and not from without. This applies to new plants in the crushed stone industry and the lime and limerock industries as well as the sand and gravel industry.

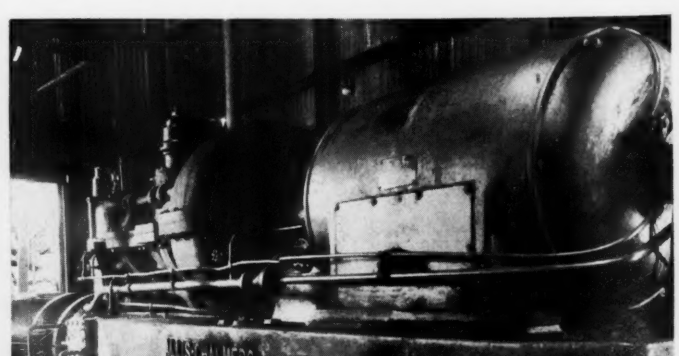
The new plants, with a few exceptions, went in where there would seem to be already an excess of productive capacity. Their cause for existence is in nearly every instance the rapid expansion of paved highway construction. Their future, when present highway programs are completed, is problematical; for unless the Southern States become much more industrialized than they are now they will have neither the population nor the wealth to continue to consume a large production of rock products.

Some of the new plants constructed or under construction in the South are: Weston and Brooker Co., Camak, Ga., crushed stone; Georgia Limerock Co., Perry, Ga., crushed stone; Muscle Shoals White Lime Co., Denie, Ala., hydrated lime plant; Consumers Sand and Gravel Co., Franklinton, La., sand and gravel; Consumers Sand and Gravel Co., Jackson, La., sand and gravel; Interstate Gravel Co., Baton Rouge, La., sand and gravel; Norfleet Gravel Co., Lecompte, La., sand and gravel; Gifford-Hill and Co., Inc., Trout, La., sand and gravel; Clement Sand and Gravel Co., Sibley, La., sand and gravel; Parker Gravel Co., Sibley, La., sand and gravel., and Louisiana Quarry Co., Inc., Winnfield, La., crushed stone.

Not only has the year shown a large number of new plants constructed but there were several plant enlargement programs which were virtually new plants. Among these might be mentioned the new all-steel screening plant of the Birmingham Slag Co., Ensley, Ala.; the new washer of the Parker Gravel Co., West Monroe, La.; and the new washer of the Brookhaven Gravel Co., Brookhaven, Miss.

The sand and gravel industry centralized around Alexandria, La., with plants in existence prior to 1931, is a typical example of

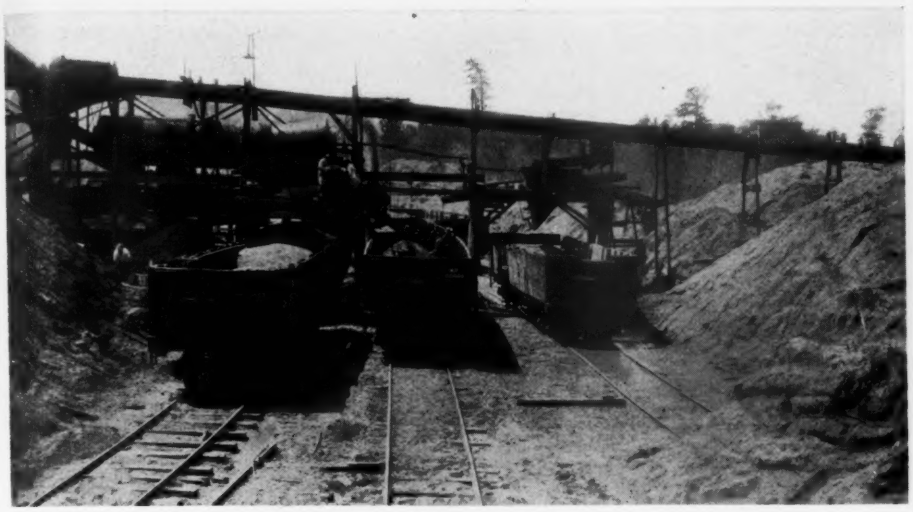
Dredge pump with diesel engine and silent chain drive at Alexandria Gravel Co. plant



Steam turbine power unit at Evangeline Gravel Co. plant

competitive conditions in many districts, not only of the South but of the Northern States as well.

In the district to the south of Alexandria are several sand and gravel operations of considerable importance which are capable of shipping all the way from 15 to 100 cars of washed gravel per day each, to say nothing of larger sand shipping possibilities.



At Alexandria Gravel Co. plant the three products fall to cars on three tracks

Among these producers might be mentioned Gifford-Hill and Co., Inc.; Alexandria Gravel Co.; Rapides Gravel Co. at Woodward, La.; Evangeline Sand Co. at Evangeline, La., which operation is now a part of the Alexandria Gravel Co.; Forest Gravel Co. at Forest Hill, and others. Gifford-Hill and Co., Inc., has three plants in this district, one at Forest Hill, a second at Turkey Creek, and a new plant to the north of Alexandria, at Trout, La. The operation at Turkey Creek was formerly the Belle Cheney Sand and Gravel Co.

The sand and gravel plants in west-central Louisiana adjacent to Alexandria are quite different from those in the eastern section of the state, although the deposits are alike, in many cases, in their physical characteristics.

In both sections the gravel is of small size and with clay balls. With one or two exceptions overburden is not removed. The gravel contains a high percentage of sand, and some deposits are partially reconsolidated, so that some blasting is required to drop the material to the suction head.

The great difference in the recovery operations is in the wider use of Diesel engine driven dredges, the use of vibrating or revolving screens at practically all plants, and the extensive use of cutters on the suction lines of the dredges. It will be recalled that in eastern Louisiana stationary screens were used at all the plants, with one exception (see Rock Products, May 23, 1931).

As most of the producers in western Louisiana started out as shippers of clay-gravel and railroad ballast (the washing of gravel having been more or less of a new thing with them), the transportation from and around the pits is done almost entirely by means of 55- to 60-ton steam locomtives and all trackage is of standard gage. Many of the operators have from three to five miles of standard gage trackage and own their own steam locomotives.

In comparing the Diesel driven units with the electric drives it appears that the early producers of sand and gravel used Diesel equipment, but these engines were old style and not as efficient mechanically nor as efficient as to oil consumption as the modern Diesel or semi-Diesel engine. These older installations showed a high operating cost, so that there has been a gradual trend towards electrification, especially where electric power from public service corporations was available. Electric power from this source, however, proved expensive in most instances, and one operator who had three suction dredges in operation stated that a power bill of $6000 per month was not unusual.

Then into the picture came the modern Diesel engine which operated on fuel consumptions as low as 3 bbl. of oil per 12 hours on a 12-in. dredge, so that we now find a new trend again toward the use of Diesel-driven units for the dredges, draglines and washing equipment. Where the plants are now electrically driven there is a possibility of using Diesel-driven generator sets, located ashore, as a substitute for the high-cost purchased electric power. For many of the producers who have more than one dredge this arrangement would seem to be ideal.

In the plants south of Alexandria a type of gravel scrubber or washer is in use that is peculiar to the district. It is made in local shops, mainly by the Alexandria Foundry Machine and Boiler Works of Alexandria, La. These scrubbers were a development necessitated by the presence of clay in with the gravel. They are usually in two units, the upper unit being a double jacketed type of Gilbert screen, usually with $\frac{3}{16}$-in. slotted perforation in the outer jacket and 2¼-in. round holes in the inner jacket.

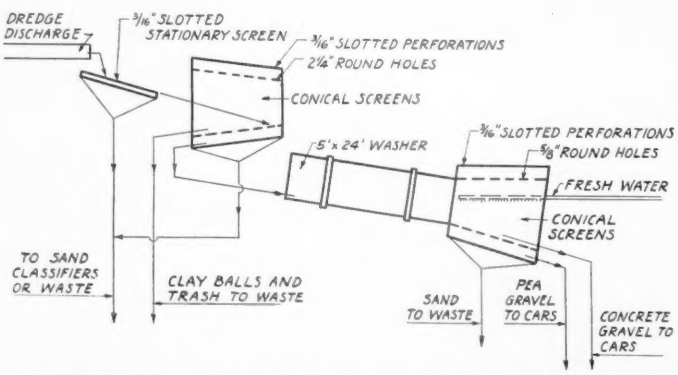
In some of the operations a stationary slotted screen is used ahead of this rotary screen to remove some of the water and sand, and in either case the sand is usually run to the sand classifiers or back to the pond. The oversize on the 2¼-in. inner screen is usually wasted, as it is mostly trash and large clay balls, hardly any of the gravel

Another view of Alexandria Gravel Co. plant showing sorting belt

being larger than that size. The throughs from the inner jacket pass to the scrubber, which is usually 5 ft. in diameter by 24 ft. long and is provided with spiral baffles that "worm" the gravel through the barrel of the washer and at the same time act as lifter plates to further assist in the breaking down of the clay particles. The scrubber can be so built that the baffles retard the flow of gravel.

Diesel engine driven dredge at Alexandria Gravel Co. plant

Two conical screens are attached to the end of the scrubber, the outer screen usually having $\frac{3}{16}$-in. slotted perforations and the inner, ⅝-in. round holes. The fines from the outer screen are sands and are usually wasted. The material retained on the outer screen is pea gravel and that retained on the inner screen is concrete gravel. Fresh water is usually applied to this end screen. The entire screening unit requires usually about 50 hp. to operate it.



Typical flow sheet of plants around Alexandria, La.

Brief descriptions of plants in this district follow and give an idea of operations in this area.

Alexandria Gravel Co.

This company recently took over the Evangeline Gravel Co., at Evangeline, La., which, however, operates as a distinct and separate company. The main operations of the company are at Woodworth, La., about [illegible]0 miles south of Alexandria. At that location a 12-in. Amsco steel hull dredge boat driven by a 340-hp. Worthington Diesel engine has proved very satisfactory and has given a very low operating cost. The dredge is equipped with a marine type cutter which gives a higher ratio of solids to liquids than most of the operations in the South, and gives the plant a high production tonnage.

The deposit runs about 60% gravel, all of which is comparatively small in size. The cutter can dig to a depth of 45 ft. below water, which is ordinary practice with a bank of gravel extending approximately 45 ft. above water so that a large tonnage of material can be moved and still not require excessive pipe lengths or booster pumps.

The screening system is typical of the district, using the Alexandria scrubber as previously described. The discharge from the pump first passes over a short, stationary dewatering and de-sanding screen, the fines of which pass to the sand cones or to waste. By blanking off part of this screen more sand can be sent through the system. The oversize then falls to a short conical screen of the Gilbert type having two jackets.

The outer jacket of this screen is provided with ¼-in. to 3/16-in. perforations and the fines from this pass to a Link-Belt sand cone which discharges direct to gondola cars for shipment. The oversize from the two jackets join and pass to an Alexandria Foundry Machine and Boiler Works scrubber. The end of the scrubber is provided with a section of two conical screens which revolve with the scrubber and produce the pea gravel and concrete aggregates. The pea gravel is diverted through a chute to a standard gage car for shipment, while the coarser gravel falls to a short belt conveyor where several men are stationed to remove any clay balls, old roots or other foreign material from the gravel.

A novel feature of the plant as compared with northern operations is that there are no bins, the material being loaded directly to the cars. There are three lines of standard gage railroad track under the plant, one track for the sand, one for the pea gravel and one for the coarse gravel. In the South there are many plants using this same loading system. The company has its own switch engines and ground storage space is provided about a mile from the plant, where a 1-yd. American gasoline engine-driven crane with clamshell bucket handles material to and from storage.

The rotary screens and scrubber are driven by an 80-hp., Chicago Pneumatic Diesel engine. The company maintains about 1¼ miles of standard gage railroad track which connected with the Missouri Pacific railroad at Woodworth, La.

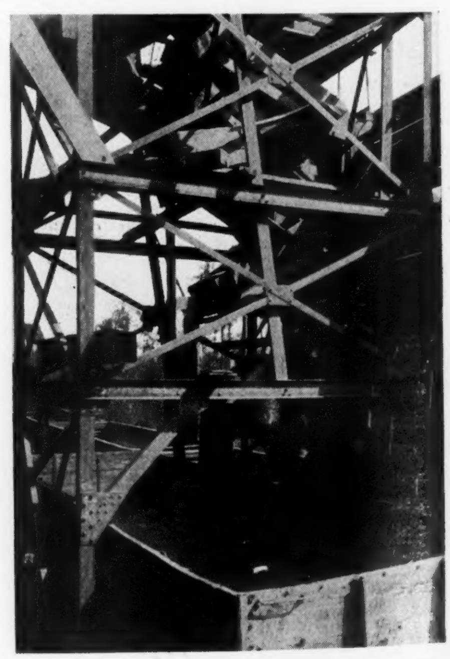
This plant has a capacity of 40 cars of washed gravel and 15 cars of sand per day. In addition 30 cars per day of sand-clay can be shipped. These figures are based on 24-hour operation.

The offices of the Alexandria Gravel Co. are in the Weil Bldg., Alexandria, La. J. C. Raxsdale is president; J. N. Weil, secretary and treasurer, and F. M. Raxsdale is superintendent.

Evangeline Plant

At the company's Evangeline, La., plant a 10-in. suction dredge is used which is driven by electric power generated by a shore plant. This is a steam plant with a 216-kw. Allis-Chalmers generator which is direct connected to a steam turbine of the same make. Wood is used for fuel.

The dredge pumps to a battery of three Universal vibrating screens which discharge direct to cars below. The capacity of the plant is as yet undetermined, as the vibrating screens have only been in operation a short time and are an unknown factor with these operators, in as much as the installa-



Washing plant of Evangeline Gravel Co.

Two views of diesel engine driven dredge at Forest Gravel Co. plant

tion is quite new and has only been in the new owner's hands a short time. However, they are quite optimistic as to the plant's possibilities.

The plant is located on the Rock Island railroad at Turkey Creek, La., and about three miles from the Turkey Creek plant of Gifford-Hill and Co., Inc. J. C. Raxsdale is general manager; J. N. Weil, sales manager, and Carroll Miller, superintendent.

Forest Gravel Co., Inc.

One of the newer plants, now a year and a half old, built in the section near Alexandria, is that of the Forest Gravel Co., Inc., with a pit and washing plant at Forest Hill, La. This operation is about three miles from the Forest Hill plant of Gifford-Hill and Co., Inc., and while the plant and dredge are only about a year and one-half old, clay-sand and pit-run gravel have been taken from the deposit for several years. The operations are now being conducted by the estate of Robert Stack. The offices of the company are in the Bentley hotel at Alexandria.

General view of Evangeline Gravel Co. washing plant

The plant uses a 10-in. suction dredge provided with a Swintek cutter and is powered by a 255-hp. Fairbanks-Morse Diesel engine. This dredge excavates to a depth of 35 to 40 ft. below the water line and the bank extends approximately the same height above water. The deposit runs about 40% gravel and 60% sand.

As at the other operations in the district, the bank has to be blasted from time to time, it being customary to do this by lowering a number of sticks of 40% dynamite against the bank below the water and shooting it.

The washing plant is typical of others in the district, with a flow sheet similar to that on the preceding page, and makes use of the system and equipment of the Alexandria Foundry Machine and Boiler Works, Inc., with home-made sand cones of a type common in the South for recovery of the sand. Two 25-hp. style "H" Fairbanks-Morse semi-Diesel engines drive the screening and scrubber equipment.

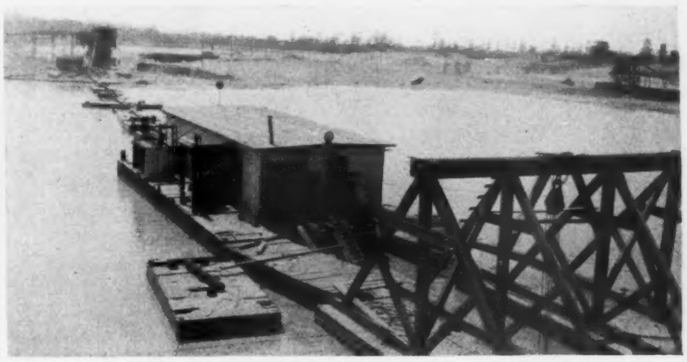
No bins are provided, the product falling directly to cars on three railroad tracks below. The plant has a capacity of 15 to 17 cars per day.

For switching to the main line of the Missouri Pacific railway the company maintains a 60-ton standard gage steam locomotive.

Considerable clay-bound sand and gravel is shipped as bank-run material which is loaded by a 1-yd. American gasoline-engine driven drag-line. W. C. Lay is superintendent.

Gifford-Hill and Co., Inc.—Forest Hill Operation

Of all the sand and gravel operations of Gifford-Hill and Co., Inc., throughout the South the Forest Hill plant, some 26 miles south of Alexandria, La., is perhaps the largest and is the most interesting of their many units. The plant has a capacity of 100



Two views of dredges at Forest Hill plant of Gifford-Hill and Co.

New dredge at Forest Hill plant of Gifford-Hill and Co. which will later deliver to a booster pump on shore as shown at left

cars per day of washed gravel and 20 cars per day of sand, although this latter figure could be increased by a wide margin should it become desirable to do so.

The company has three suction dredges, two equipped with Bennett pumps and one with a 12-in. Amsco pump, all mounted on wooden hulls. General Electric motors of 300-hp. are used on two of the boats and a 300-hp. Allis-Chalmers motor is used on the third. All of the dredges are provided with cutters and dig 40 ft. below water with a 30-ft. bank above water line. They pump to stationary screens located at several sites between the main washing plant and the dredges. These screens are regulated so as to return most of the sand to the dredge pond while the balance falls directly to standard gage gondolas. The gondolas are then switched to the plant where the gravel and sand is dumped from a trestle to a temporary storage pile which supplies the washing plant.

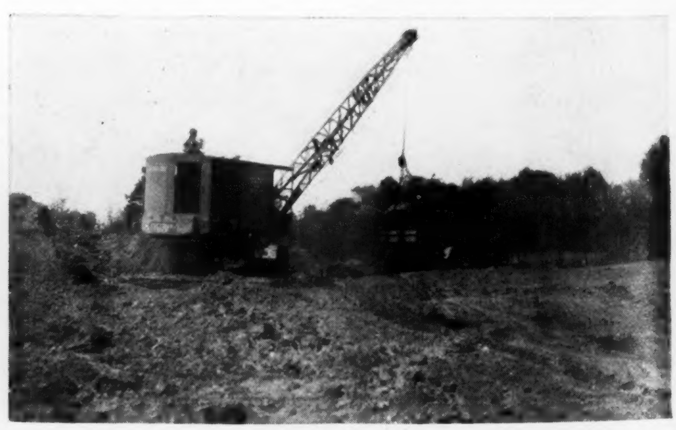
The bank at Rapides Gravel Co. operation will run more than 100 ft.

A 3-yd. Sauerman Crescent scraper then delivers the material to a hopper serving a sorting belt conveyor from which several men remove any large clay balls or other foreign matter. The gravel is then carried on an inclined belt conveyor to the washing plant. Two rows of Link-Belt conical screens with four screens in each row are used for washing and sizing and the products fall to wooden bins below. Purchased electric power is used. A reclaiming tunnel passes under the bins from which the material is drawn on to a belt conveyor for loading.

Surplus gravel from the washing plant can be drawn to 12-yd. Western side-dump cars, of which there are four for this work, transported to a newly opened dredge pond and dumped for storage below water. Two American steam locomotives, one 60-ton and one 40-ton, are used for switching cars. Several sizes of gravel can be stored along the margin of this pond and when a desired size is wanted it can be reclaimed by the suction dredge. This dredge can also dig from the bank.

At this location a departure from the standard practice of Gifford-Hill and Co. is in process of trial. Instead of delivering direct to cars from the stationary screens, an 8-in. booster pump is being installed to take the material from the dredge and deliver it to the screens. This will assist in the disintegration of the clay balls and will also permit the dredge to operate over a wider area than before. A similar procedure is also being followed at its new plant at Trout, La.

Parts of the deposit are stripped by a



Forest Hill plant of Gifford-Hill and Co. Drag scraper delivering to belt conveyor, at left; dragline excavator loading stripping to trucks, at right


Two views of Forest Hill washing plant of Gifford-Hill and Co.

1-yd. Bucyrus-Erie dragline which loads to trucks. The dragline is driven by a Waukesha gasoline engine. A Fordson tractor and road scraper is available for maintaining the road for these trucks.

This plant is located on the Texas and Pacific railroad. L. E. Reel is superintendent; Lee Dixon, general foreman, and C. E. Wilson is in charge of shipments.

Turkey Creek Plant of Gifford-Hill and Co., Inc.

This operation was formerly the Belle Cheney Sand and Gravel Co. but about a year ago Gifford-Hill and Co., Inc., took over the operation and installed a 10-in. Bennett pump, which is belt driven from a 200-hp., "Y" type, Fairbanks-Morse Diesel engine. A 50-hp. Chicago Pneumatic Diesel engine drives the rotary screens and the scrubber. The plant has a capacity of 17 cars of sand and gravel per day of 24-hr. and during the summer has worked 24-hr. shifts.

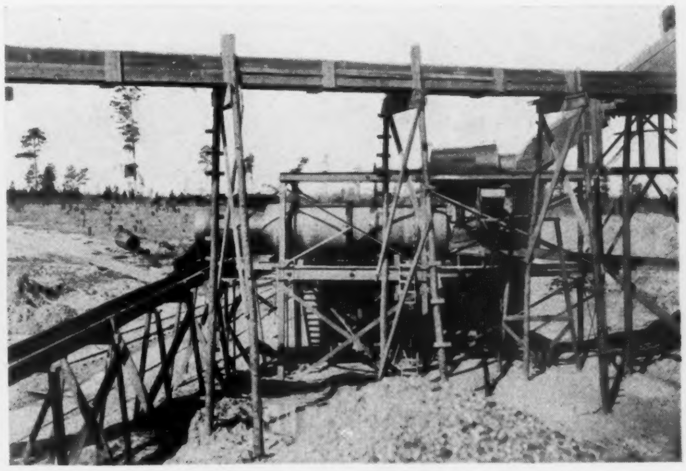
The deposit is roughly 75 ft. in depth with 40 ft. of this below the water level. No stripping is done, although it is necessary to remove some trees and brush from the top of the bank.

This plant, like the many in the district, uses the Alexandria scrubbing system.

The pump discharges to a spreading table which in turn serves a stationary dewatering and de-sanding screen. The fines from this flow to a sand cone located above the railroad track which discharges direct to the cars for shipment.

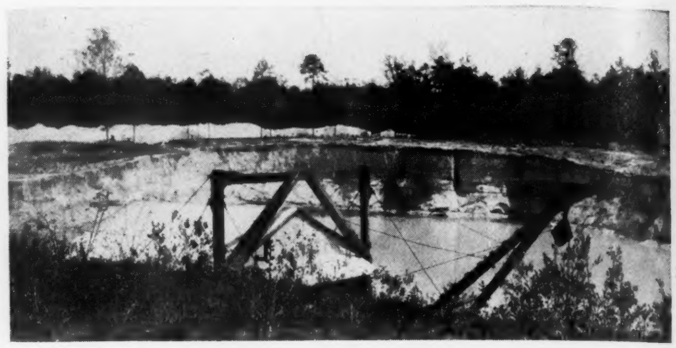
The oversize from the stationary dewatering screen passes to two Gilbert type screens, the first of which has 2¼-in. round perforations and removes any large clay balls, roots, etc., discharging them to waste. The throughs from the first screen pass to a second conical screen with ¼-in. perforations which removes most of the sand, passing it to the sand cones or to waste.

The oversize from this screen passes to the scrubber, which is similar to that at the Alexandria Gravel Co. operation. It is provided with a double end screen, the fines from the inner screen being the pea gravel and the throughs from the outer screen any remaining sand, which is rejected. The oversize on the inner screen is the concrete gravel.

Washing plant of Forest Gravel Co. at Forest Hill with Alexandria type scrubber and sand settling tank at left


Two views of new dredge of Rapides Gravel Co. at Alexandria with washing plant in background



Two views of the diesel engine driven dredge of Gifford-Hill and Co. at Turkey Creek

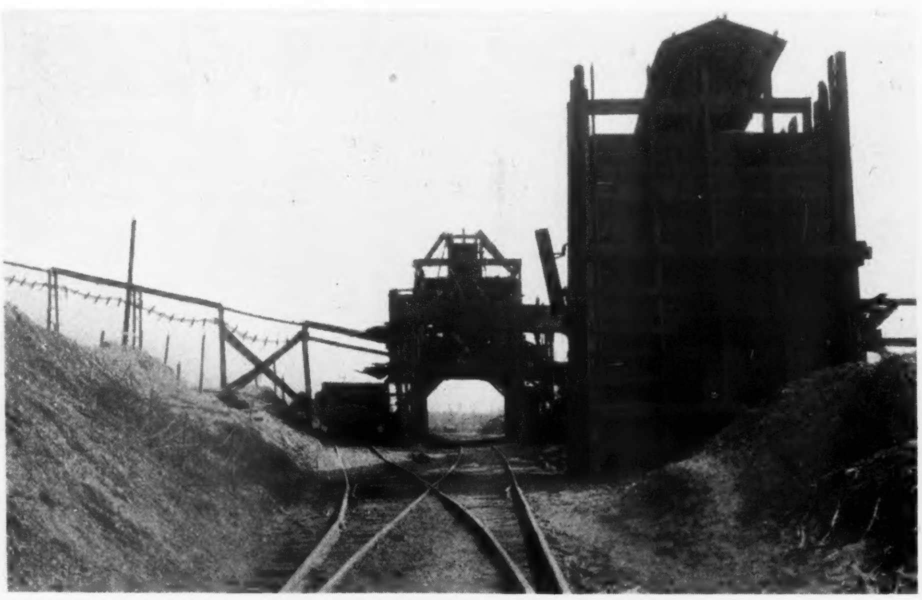
The sand from the cones, the pea gravel and the concrete gravel all fall direct to separate cars, there being no storage bins. Shipments are made over the Rock Island railroad. E. S. Grayson is superintendent and R. W. Lacey is in charge of the plant office.

Rapides Gravel Co.

This plant is a short distance from the plant of the Alexandria Gravel Co. and is one of the large producers of the district, producing 2½ cars of washed gravel per hour and a similar tonnage of sand. The system of dredging is similar to that used in eastern Louisiana; that is, the use of a "digger" suction dredge which relays to other dredging equipment. The company has three Diesel driven dredges, all of which are equipped with 10-in. Amsco pumps belt-driven from 240-hp. Fairbanks-Morse "Y" type, four-cylinder, Diesel engines.

One of these dredges is new. It differs from the other two in that it has a steel hull and is equipped with an "Eagle" Swintek cutter and acts as the digger dredge. This dredge delivers back to the dredge pond about 450 ft. from the pump, where one of the other two pump dredges delivers the material to the plant.

This system of dredging assists greatly in the disintegration of the clay balls which are invariably associated with gravel through the South.

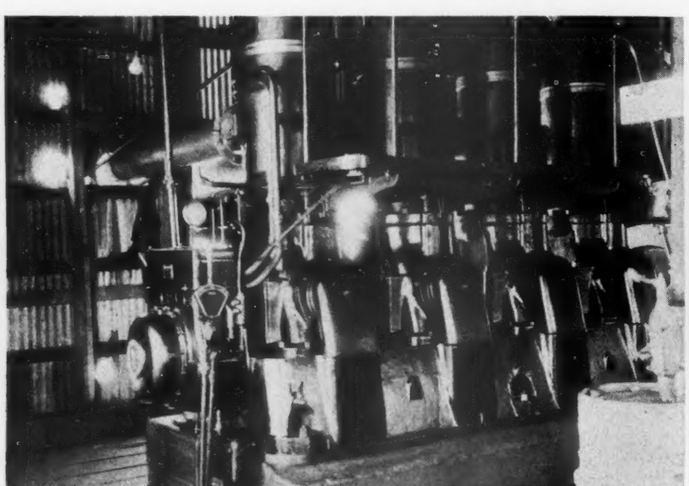


Washing plant of the Rapides Gravel Co. at Alexandria

The deposit is rather unusual, mainly in that good gravel is dug at a depth of 45 ft. below water with a bank above water level ranging from 30 to 100 ft. in height. Some blasting is done to loosen this bank.

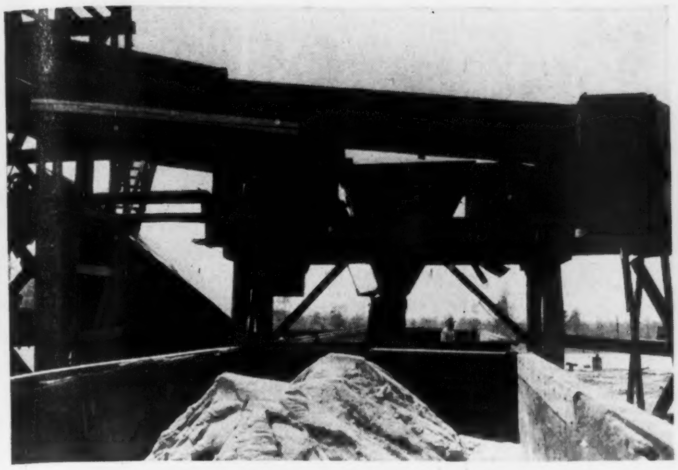
The plant is located at Valde Rouge, La., on the Missouri Pacific railroad and a 2½ mi. spur connects the plant with the main line. The company does its own switching, using 60-ton steam locomotives for this work. Valde Rouge is roughly 20 miles south of Alexandria, La.

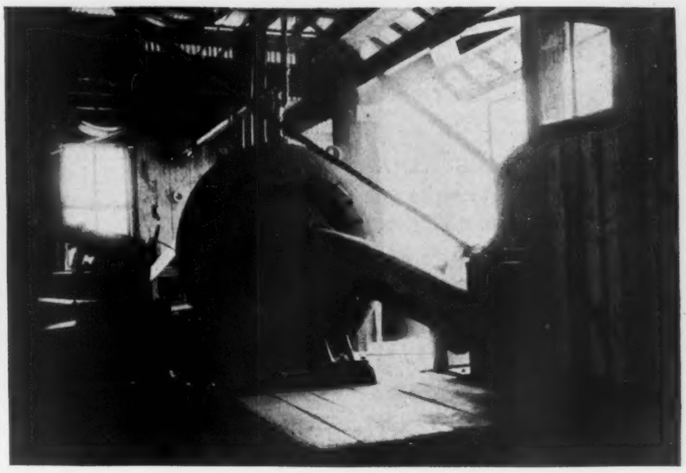
The operation of the plant is somewhat



200-hp. diesel engine driving dredge pump

50-hp. diesel engine driving washing plant





At Turkey Creek plant of Gifford-Hill and Co. sand is discharged direct to cars. Right, 10-in. pump belt-driven by 200-hp. diesel engine

similar to that of the Alexandria Gravel Co., the Forest Gravel Co. and the Turkey Creek plant of Gifford-Hill and Co., Inc., and uses scrubbers and dewatering screens of the Alexandria Foundry Machine and Boiler Works.

At this operation the sand and concrete gravel are discharged direct to cars for shipment, but the pea sized gravel falls to a belt conveyor which elevates it to a small storage bin from which cars are loaded. The plant is driven by a 50-hp., "Y" type, Fairbanks-Morse Diesel engine.

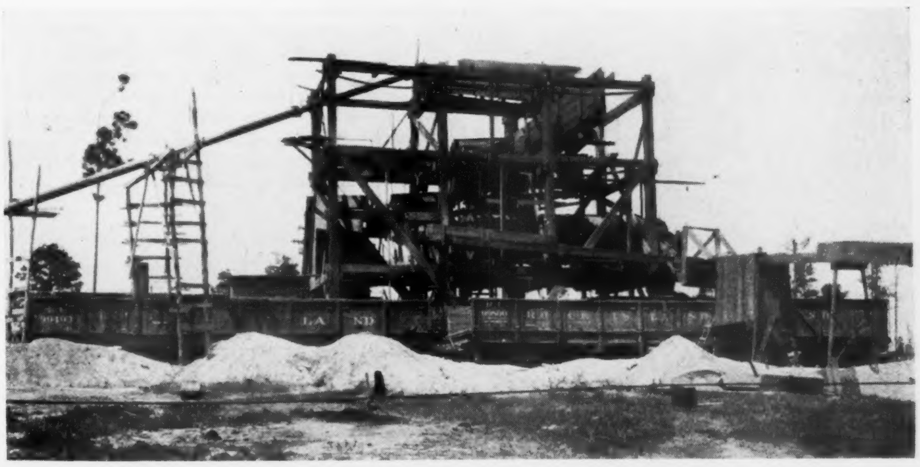
The offices of the Rapides Gravel Co. are at 907 Fourth St., Alexandria, La. R. C. Baker is president; O. T. Odin, vice-president, and R. S. Thornton, secretary and treasurer. Mr. Odin is also superintendent of the plant.

United States Mint Aids Prospectors

WALTER W. BRADLEY, state mineralogist of California has been advised by M. J. Kelly, superintendent of the mint, at San Francisco, that the mint will now accept gold in quantities of 2 ounces and over.

The rules and regulations governing the United States mints state that a deposit must be of $100 value before it can be received. On June 2, the director of the mint authorized the superintendent at San Francisco to accept deposits of gold in quantities of 2 ounces or over. The order applies only to gold in the natural state, and not to dental or jewelry scrap, or other fabricated material.

This permission has been granted for the purpose of encouraging small-scale placer mining (such as that in connection with sand and gravel operations) during the present season only, and is not permanent.



Washing plant of Gifford-Hill and Co. at Turkey Creek

Left, concrete gravel being discharged direct to cars from combination washer-screen at the Turkey Creek plant. Right, oversize from screen ahead of washer is rejected as waste

The Washing of Crushed Stone

DEAR MR. ROCKWOOD: You have requested me to write you something of our experience in washing crushed stone and to touch upon the salient points of such operations.

Some 20 years ago the Brownell Improvement Co. opened up a new quarry at Thornton, Ill., which unfortunately proved to be quite seriously cross-cut with vertical seams carrying various quantities of top soil and disintegrated brownish stone. Such material naturally contaminated the finer sizes of stone produced by the crushing plant and made them unsalable. The company asked us to look into the matter and make recommendations.

After some study we decided the stone could be cleaned by washing it in a plant similar to those we had built for washing gravel. Such a plant was built in the spring of 1910 from plans we furnished and it operated most successfully for many years.

The photograph I am enclosing gives a very good general idea of the Brownell plant. It was built near the crushing plant and received all the minus 3½-in. material coming from the primary crusher. This we separated out by large revolving scalping screens. The primary crusher was a No. 12 McCully gyratory set to make about a 5½-in. product, so that something like 45% of the primary crusher product was rejected by the scalping screens and passed on through the crushing plant. As such material was substantially free of contamination and in recrushing many fresh clean surfaces were exposed, a satisfactory commercial stone was produced.

The minus 3½-in. material was carried to the washing plant by a 30-in. inclined belt conveyor which discharged to a mixing box, where about 1200 gallons of water per minute under about a 50-ft. head was directed against the stream of stone by flattened nozzles. The stream of stone and water was then divided in flowing through suitable launders between two 36-in. by 54-in. by 72-in. Gilbert type conical screen, which had about 2½-in. round hole perforations. These were run somewhat slower than we had been accustomed at that time to running similar screens washing gravel. The rejects of these screens were 3½-in. by 2½-in. stone and, just as this stone left the screen, we gave it a thorough washing with clean water directed by flattened jets, to remove the coating of muddy water it naturally carried on being separated out of the main stream.

The undersize from the 2½-in. perforations of the first screens, together with all of the water added at the head of the plant, flowed through suitable launders to a second set of 36-in. by 54-in. by 72-in. Gilbert type screens, which were equipped with 1¼-in. round hole perforations. The undersize from these screens passed on to a third set of the same size and type of screens having ¾-in. round hole perforations, which were in turn followed by a fourth set of similar screens having ¼-in. round hole perforations, and the rejections of each of these screens were given a thorough final washing with clean water in the manner described above for the first set of screens. So all sizes carried coatings of clean water only as they fell to the bins below, and this is a vital point to be observed in washing stone, as a coating of muddy water on otherwise clean stone will, when the stone dries in transit, produce a film on the stone that is apt to make it unacceptable at the job.

Fortunately, the contaminating materials carried with the Brownell stone readily went into solution during the above described washing process, so we were able to separate the screenings or minus ¼-in. to about plus 30-mesh stone out of the stream coming from the last Gilbert screens. This was done with tipping gravity type automatic discharge settling boxes such as we had designed several years previously for use in gravel washing plants, but we narrowed the flow path through the top of these boxes to keep up the velocity of the stream and we introduced small jets of clean water into the bottoms of the boxes to rinse the screenings before they were discharged.

The above described screens and separating boxes were mounted above a set of side loading bins of about 500 cu. yd. live capacity, as clearly shown by the photograph. One man attended the conveyor, screens and boxes, and about 35 hp. was required to drive the machinery. This was furnished by a manila rope drive from the main lineshaft of the crushing plant. The plant had a capacity of easily 35 cars, or about 1750 tons, of finished stone per 10-hour day and I never heard of a car being rejected.

Following the Brownell plant we built similar plants in the next year or so for the United States Crushed Stone Co. at McCook, Ill., and the Dolese and Shepard Co. at Gary, Ill., both of which concerns had stone which was quite easily washed, and plants along similar lines to the Brownell plant gave quite satisfactory results.

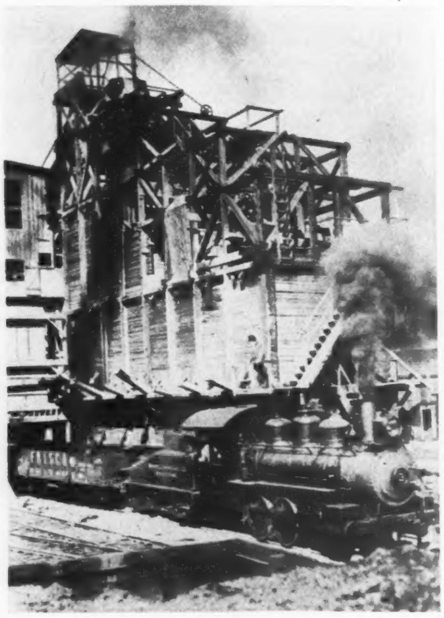
In 1915, however, we ran into a problem of cleaning screenings that gave us a real battle. The city of Chicago was driving a 14-ft. diameter water-supply tunnel some eight miles long. This tunnel was about 160 ft. below the surface and through what appeared from the core drillings to be clean white Niagara dolomite, common to the Chicago area. A concern known as the Peoples Crushed Stone Co., in which the writer was interested, entered into a contract with the city to purchase the excavated mine-run stone at the four shaft heads along the tunnel, and we built a plant at Montrose avenue and the Chicago river for crushing and separating the stone into the sizes re-

Editors' Note

THE washing of stone is commanding the attention of so many operators at this time that we asked J. C. Buckbee, consulting engineer of Chicago, who has served the crushed stone, sand and gravel and cement industries for over 25 years and who also has for many years been a producer of crushed stone and washed sand and gravel, to write us briefly his experience. His letter is given herewith and is most interesting and instructive.

Operators should bear in mind, when considering washing their stone, that their customers are going to expect a much more perfectly cleaned and accurately sized stone from a washing plant than they have been accustomed to from a dry screening plant, and anything short of their expectations is going to bring complaints, if not rejections.

It must also be remembered that many stones, on being subjected to washing, develop characteristics not previously known or readily recognized, and Mr. Buckbee's suggestion that too much care can hardly be taken in approaching a stone washing problem is indeed well taken.—The Editors.



Washing plant of Brownell Improvement Co.

quired by contractors for concrete work and paving.

Appreciating that the stone coming from so far underground would be at least damp, and therefore would not separate cleanly in dry screens, we built a washing plant quite similar to the Brownell plant described above, except that it was preceded by a No. 7½ Gates Style K gyratory crusher set to make a 2½-in. product and had a No. 4 Gates crusher for secondary reduction, and a continuous inclined bucket type elevator was used to take the crusher product to the head of the plant.

On starting the plant we were unable to make clean stone of the larger sizes, and the minus 5/16-in. stone or screenings was so seriously contaminated with a bluish muck that it was useless. Further, the tipping automatic settling boxes refused to operate regularly, and, when they did open up, flushed badly and let great quantities of muddy water into the bins below.

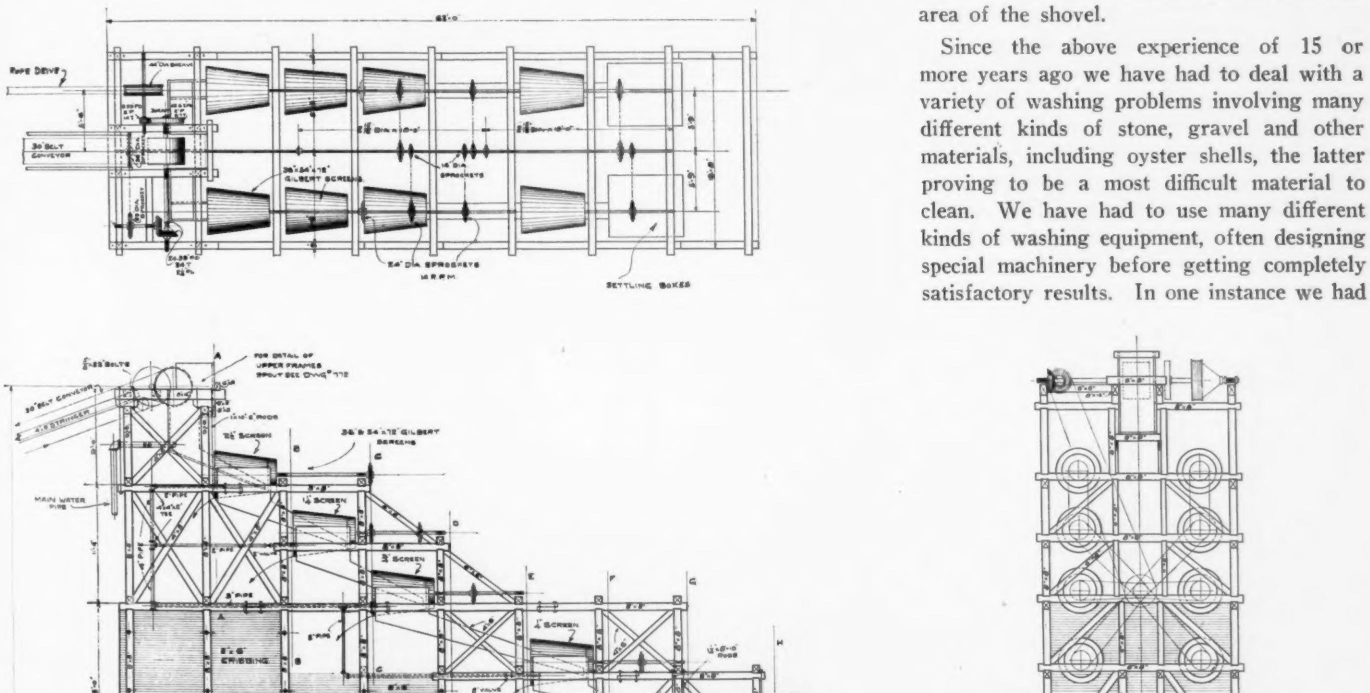
Careful examination under a magnifying glass developed the fact that the stone had cleavage planes filled with films of blue clay-like material that would not readily go into solution, and it was obvious that these cleavage planes opened up on crushing and that the blue clay-like material was the source of our trouble.

We soon cleaned up the larger sizes of stone by putting two or three rings of angle iron inside the revolving screens and thoroughly washing the stone between each set of these rings with jets of fresh water under considerable pressure and flowing through flattened nozzles directly into the most heavily loaded section of the screen. However, cleaning the screenings was quite another matter that took us through many experiments and consumed much time and money, to say nothing of the value of the screenings we had to discard.

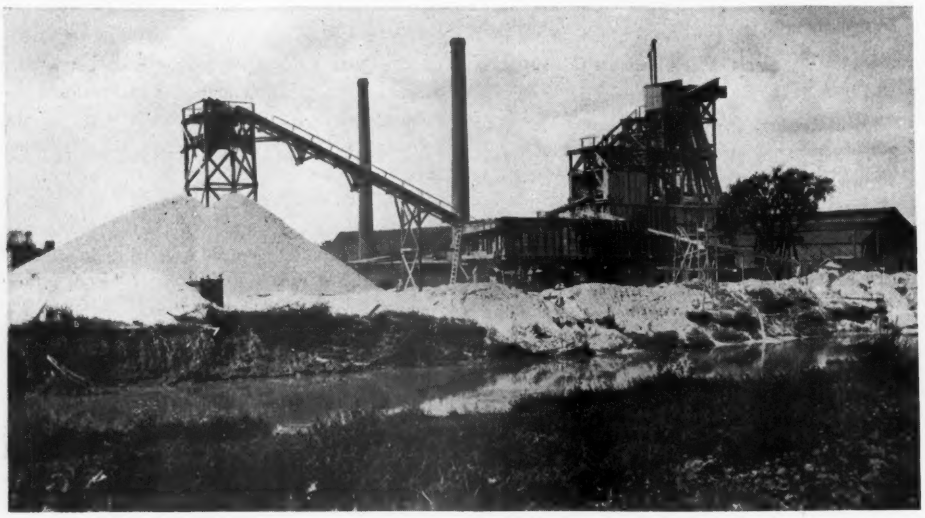
We finally built an inverted pyramid shaped separating box 7 ft. 6 in. by 15 ft. at the top and 7 ft. 6 in. deep with a feed box across the top having a bottom perforated with 2-in. diameter holes to distribute the flow of material into the box uniformly and avoid any short circuiting areas. From the bottom of this box two 12-in. diam. double flight screw conveyors, each 24 ft. long and running 23 r.p.m., were set at an angle of 22½ deg. from the horizontal in an open top box whose sides came up above the top of the pyramid-shaped box. The conveyors were set about 12 in. apart and revolved toward each other. In the lower part of the pyramid shaped separating box, directly over the lower end of the screw conveyors, we introduced several small jets of fresh water, so there was a rising current of fresh water through which the stone had to pass in falling to the screw conveyors. The overflow from the pyramid shaped box was taken off uniformly along an entire side to avoid any short circuiting areas.

This separating box cleaned our screenings perfectly and gave a product so thoroughly dewatered that the screenings could be immediately shipped in a truck down the city streets. Such drip as came from the trucks was clean water, and I would add, as a matter of considerable interest and to be carried in mind when considering washing stone carrying clay-like material, that the material we had succeeded in washing off from the stone assumed a rubber-like consistency on settling; in fact, in taking some from under water in a settling basin it came out on a shovel in sections larger than the area of the shovel.

Since the above experience of 15 or more years ago we have had to deal with a variety of washing problems involving many different kinds of stone, gravel and other materials, including oyster shells, the latter proving to be a most difficult material to clean. We have had to use many different kinds of washing equipment, often designing special machinery before getting completely satisfactory results. In one instance we had



Details of Brownell Improvement Co. stone washing plant



Washing plant of Peoples Crushed Stone Co.

to go to a machine similar in construction to a drum concrete mixer, running under water, and we have often had to go to double washing, and, as I recall, in one instance to triple washing, each washing being made with clean water.

Practically every stone and every contaminating material displays different characteristics. Some stones can be readily cleaned on revolving or vibrating or shaking screens. Others will require preliminary treatment in a barrel or drum type scrubber or perhaps a log washer to thoroughly soften the contaminating matter. Again, nothing short of very high pressure jets of water driving and tumbling the stone in its passage through a washing chamber will loosen and remove the foreign matter. Each case is a problem by itself and the greatest of care should be taken in preliminary examination and experimentation to learn the characteristics of both the foreign matter and the stone, for the process and equipment that will give thoroughly satisfactory results on one stone may be a flat failure on another stone, that, from a casual examination, seems identical in character and contamination. (Witness our experience with the fines at the Peoples Crushed Stone Co. plant.)

Stone washing plants are usually built to improve a product. Nothing travels so fast as the news of a plant that fails to give expected results on starting and, as "it takes a dog a long time to live down a bad name," it may be said too much care can hardly be taken in proceeding with a stone washing problem.

J. C. Buckbee.
Chicago, Ill., October 24, 1931.

Tells Ohio City's Council of Blasting Tests

MEASUREMENT of the vibrations resulting from discharge of dynamite in the quarries of the France Stone Co., at the western edge of Bellevue, Ohio, have indicated that earth disturbances are not sufficient to cause property damage, even though the "shock" registered on human bodies and the rattling of windows, etc., caused by concussion, is apparently great, the city council was told recently in a session devoted largely to a semi-scientific discussion on the use of dynamite and the effect of resultant earth vibrations.

F. D. Bickel and John MacBlain, representatives of E. I. du Pont de Nemours and Co., and R. R. Weasner, superintendent of the local quarry, and C. R. Callaghan of the France Stone Co., appeared before the council to report on results of a series of measurements which have been made of blasts in the quarry at the western extremity of Bellevue during a 60-day period.

Mr. Bickel told of the series of tests which had been conducted within a wide radius of the quarry, and basing his assertion of the failure of vibrations, either within or without buildings, to topple the balanced pins, expressed doubt that residence properties had been subjected to damage because of blasting.

During the past 60 days, Mr. Bickel said, the France Stone Co. and the du Pont company have collaborated in studying the manner in which blasting was conducted at the local quarry, with a view of reducing complaints of "shock" by nearby residents and of increasing if possible the efficiency of the blasting. Progress has been made in both directions, he said.

In a series of tests which have been conducted, the measuring apparatus was placed at numerous points, both near and removed from point of blast, with the result that in no instance were the earth vibrations sufficient to cause the highly sensitive pins to topple, and in only two of the tests did they register sufficient vibration to wobble, the speaker said. During the tests charges varying from 700 to 1600 lb. of dynamite—the range of charge used in quarry operations—were set off, the council was told.

Despite results of the tests thus far conducted, the two companies intend to continue their efforts toward reducing the vibrations to the minimum consistent with successful production of stone, Mr. Bickel said.

Examinations of cisterns in the vicinity of the quarry failed to give evidence that they had been damaged by vibrations resulting from quarry blasts, it was asserted.

During his remarks Mr. Bickel indulged in a semi-scientific explanation of the effects of blasting on the earth and rock strata and on the surrounding air, explaining that the effect registered on the human body, rattling windows, etc., and the amount of "noise" which marked the blast was indicative of the force of concussion but was not a reliable measurement of the vibration which was caused in the earth.—*Bellevue* (Ohio) *Gazette.*

Editor Raps Commissioners for Refusing Competitive Bidding

"STONE, that great natural resource of Allen county, Ohio, again has precipitated an unusual situation in our county government," says an editorial in the *Lima* (Ohio) *News*. "This time commissioners are charged with paying twice as much for crushed stone under their no-bid plan of purchases as the commodity could be bought for.

"The commissioners admit that this condition exists. They say that they could buy at a much lower price this year. They justify their freeness with the public's money by pointing out that they fear if they buy from the 'big' producers the small operators will be stifled and then the county would be at the mercy of what would amount to a stone trust. But they mentioned three large operators who probably would continue.

"The *Lima News* is in no wise interested in the stone business or any stone producer. If they engage in price slashing, that is their business. But it is the business of any governmental agency today to save every penny of the people's money that may legitimately be saved. If the producers, through their personal battles, hammer down prices, it is not the duty of county commissioners or any other set of elected officials to tell them they can't afford to sell at prices they fix, and attempt to maintain a high price.

"Stone always will be produced in Allen county and adjoining counties. Billions of tons of this essential building material is available. There always will be producers enough to assure competition, and competition is the safeguard of the consumer.

"Allen county needs the advantage of competitive bidding in its purchases, every one of them. Splitting orders up into small lots to make unnecessary the application of competition eliminates the greatest assurance of economy in operation. The county commissioners should now, of all times, give the taxpayers the advantage of low prices available through the bidding system."

Method and Cost of Quarrying, Crushing and Grinding Limestone at Catskill Plant of North American Cement Corp., Catskill, N. Y.*

By W. J. Fullerton and Albert W. Cox†

Engineer and Experimental Engineer, Respectively, North American Cement Corp., Albany, N. Y.

THE FIRST PROSPECTING on the property was done in 1914 and 1915, and quarrying operations were started in February, 1916. During the early operation of the quarry, drilling was done by tripod drills and all stone was loaded by hand. Transition to modern methods of quarrying, to be described subsequently, was made gradually.

Geology

The Devonian beds in which the quarrying operations are conducted are folded into a series of anticlines and synclines, with the folds strongly developed along a general north-south strike. Another series of folds has an east-west strike, but is not so pronounced. The formations are disturbed by a series of overthrusts, rather closely spaced and having an easterly dip. The overburden varies from 0 to 5 ft. in thickness and consists of glacial sand and clay deposits with a small amount of siliceous material from the Oriskany.

The limestone is of the following designations: Esopus, Alsen, Becraft, New Scotland and Coeymans. The Becraft beds are high in calcium carbonate, and quarrying operations are conducted largely in them, with the method of quarrying determined by their position. Fig. 1 shows an elevation of the quarry with the limits of the present working face.

The vertically dipping Becraft stone at the east end of the quarry is difficult to drill due to seams, faults and an occasional small cave. Toward the west, where the dip is not so steep, drilling is less difficult, although the greater hardness of the New Scotland stone underlying the Becraft at the western end of the quarry slows up drilling. About one hole out of 10 is lost, due to broken drills, seams causing the drill to lose direction, etc. Most of the trouble is encountered in the vertically folded stone at the east end of the quarry.

*Abstract from U. S. Bureau of Mines Information Circular 6522.

†The authors wish to acknowledge the assistance of the following persons in the collection of information: R. W. Jones, mining engineer of Catskill, N. Y.; G. A. Witte, assistant general manager; H. F. Kichline, chief chemist, and C. A. Hartman, quarry foreman.

Foreword

THIS PAPER is one of a series being prepared by the U. S. Bureau of Mines describing mining and milling methods and costs at cement plant quarries. These papers are designed to disseminate detailed technical information regarding the methods used, as well as present costs on such a basis that they are comparable to those of other producers.

In the present paper the quarrying and milling methods are given in detail along with cost figures on the quarrying and grinding operations.—The Editors.

Prospecting and Sampling

As stated, the first prospecting on the property was done in 1914. Holes were put down with a shot drill and the core samples obtained were analyzed by R. W. Hunt and Co. of New York.

Prospecting for the second (north) quarry was done in 1920. In this instance well drills were used and sludge samples taken every 4 ft. of depth. The holes were spaced about 30 ft. apart across the rock fold and 100 ft. apart along the fold, and varied in depth from 60 to 100 ft.

Prospecting for the present (south) quarry was started April 17, 1925, and is still being carried on at intervals when drilled reserves require extension. Thus far, 85 well-drill holes ranging from 60 to 110 ft. deep have been sunk. The spacing of these holes is irregular and was made to suit the known approximate strike of the rock folds. As a general thing the position of holes was restricted to points where the Becraft limestone was not exposed or where there was doubt about the grade of rock underlying the surface. Samples of drill-muds are taken at 5 ft. intervals and are analyzed for calcium-carbonate content, with complete analyses when considered necessary.

Prospecting is done when convenient as a matter of routine and is kept about 400 ft. in advance of the quarry face.

After major jobs of prospecting, estimates of reserves are made by plotting the holes to scale on cross-section paper, and considering dip, average thickness and length of formations and calculating the contents of the proved ground in cubic yards. The tonnage is figured by assuming a weight of 125 lb. per cu. ft. For convenience the stone is considered to be of two grades; one, containing 80 to 100% of $CaCO_3$, and the other from 60 to 80% of $CaCO_3$.

Quarrying Methods

Fig. 2 shows a plan of the quarry and track. The quarry face is approximately normal to the strike of the folding. The present working face runs nearly east and west, and is about 500 ft. long by 60 to 84 ft. high. The quarry is served by a single-loop standard-gage track. The primary crusher is situated approximately north of the working face and about half a mile distant.

The light overburden, varying from 0 to 5 ft., is not removed by stripping, but is shot down and handled with the stone. It is highly siliceous, and silica is a necessary component for the cement mixture. The percentage composition of the overburden is as follows: CaO, 5.5; SiO_2, 59.8; Fe_2O_3, 6.4; Al_2O_3, 14.3; MgO, 2.9; loss on ignition, 10.0; undertermined, 1.1. The ratio of overburden to stone is about 1 to 50 by weight.

There is natural drainage from the quarry, so no provisions for taking care of water are required.

Quarrying operations are confined to materials suitable for the cement mixture, so there is no waste from the quarry, all the stone going to the mill. The output varies from 1500 tons per day for full mill operation of 1000 tons per day for restricted operation. The overburden included in this output is about 2% of the total tonnage. The quarry operates in the daylight hours only and averages about 10½ hours a day.

Drilling

Three Loomis "Clipper" drills, of traction type, are used for primary drilling, as follows:

1 No. 4ET, type AVE, with 15-hp. induction motor.

1 No. 4ET, type AVE, with 11-hp. induction motor.

1 No. 4GT, type JS, with 18-hp. Cook gasoline engine.

The electric drills are liked best because they are easily started in cold weather and because it is not necessary to haul gasoline and water to them. But since it is inconvenient to operate them at points far from the electric power lines, the gasoline drill is used for prospecting. Comparative figures for operating costs of the different drills are not available, but the following figures of performance during 1930 should be interesting:

COMPARISON OF DRILL PERFORMANCE, 1930

Drill	Total feet drilled	Hours operated	Feet per hour
15-hp. electric	5,762	1,592	3.62
11-hp. electric	3,927	1,514	2.59
18-hp. gasoline	2,806	1,119	2.51
Total	12,495	4,225	Average 2.96

experimenting over a period of about 18 months, during which time six primary blasts were set off. Distances between holes ranging from 16 to 22 ft. and distances from face to holes ranging from 20 to 32 ft. were tried, one set of measurements being used for one blast so that there was no chance for confusion through using several different spacings in one blast. After calculating the tonnage shot down against the fragmentation and ease of cleaning up the shots, the present spacings were adopted as standard.

A 7-in. iron pipe 6 or 7 ft. long is used to case through the light overburden during drilling.

Secondary drilling for breaking boulders is done by jackhammer drills, using ⅞-in. hexagon bits, varying in length from 2 to 14 ft. Compressed air having a pressure of 70 lb. per sq. in. is used.

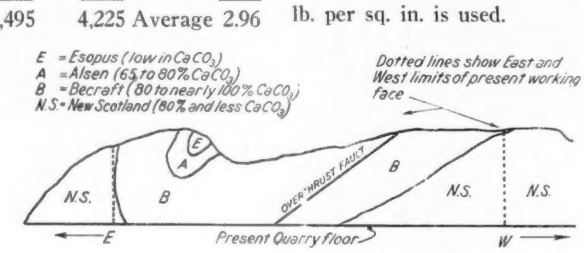


Figure 1.-Elevation of quarry, looking south

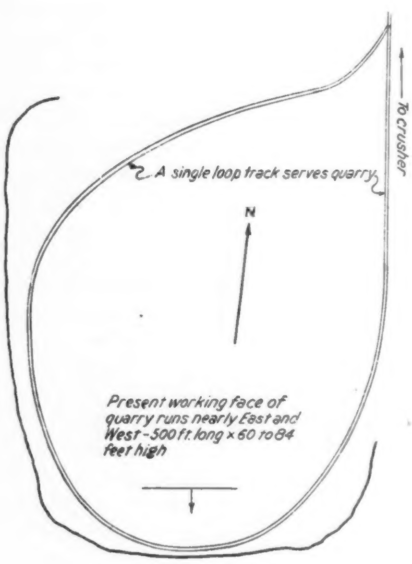


Figure 2.-Plan of quarry and track

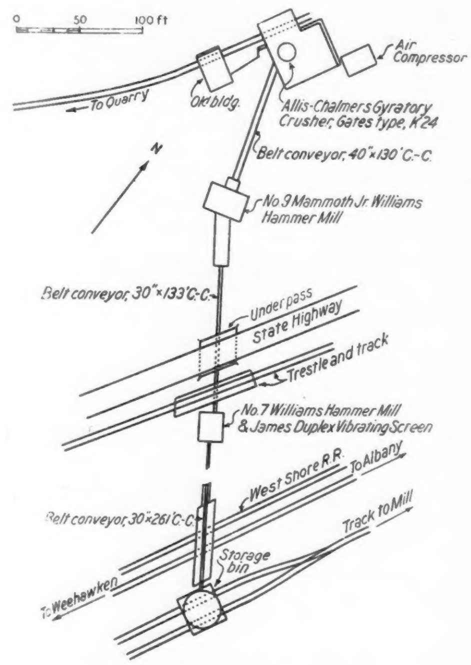


Figure 3.-Layout of crushing plant

Quarrying and crushing layout

The bits used with the drills are of the Gill type, and vary in diameter from 5½ in. for the smallest to 6¼ in. for the largest; they are all about 4 ft. long. The holes drilled are about 6 in. in diam. and extend to a point 6 or 8 ft. below the quarry floor. The holes for primary blasting are spaced about 30 ft. back from the quarry face and 16 to 18 ft. apart. The spacing is controlled by the required fragmentation, the height of face and the hardness of rock. The present practice in spacing holes was developed by

Blasting

Twenty or more holes are loaded for each primary blast. A crew of 10 men handles the routine of loading, which is about as follows: Three men truck dynamite from the magazine to a position near the holes, three men carry dynamite and earth for tamping to the holes and four men load the holes. It takes about one-half hour to load each hole.

No springing of holes is done. Where the rock is hard and solid the holes may be completely filled with dynamite, but for less solid rock the dynamite is alternated with 5 or 6 ft. of dirt, so placed that the dirt plugs in adjoining holes will be at different levels. At the bottom of every second hole and in all holes at the end of the straight section of the working face, where it curves from an east-west direction toward a north-south direction, 100 lb. of 75% quarry gelatin is used. Clay is used for tamping in summer, and stone screenings in winter.

No. 6 Hercules exploders, with plain and covered cordeau, detonate the primary blasts. No. 6 Hercules exploders are used for secondary blasts. The following tabulation shows the quality and quantity of dynamite used in 1930:

Total stone quarried in 1930, 281,400 short tons.

Dynamite used for primary blasting (sticks 5x16 or 24 in.):

	Lb.
75% quarry gelatin	11,250
60% quarry gelatin	30,850
60% Red Cross	37,800
60% Gelex A	9,050
Total	88,950

Stone blasted per lb. dynamite	3.16 tons
Dynamite used for secondary blasting (sticks 1x8 in.) (Extra D)	9,450 lb.
Stone blasted per lb. dynamite (secondary)	29.78 tons
Dynamite used for both primary and secondary blasting	98,400 lb.
Stone blasted per lb. dynamite	2.86 tons

The track along the working face and for a safe distance back along the line toward the crusher is removed before setting off primary blasts. The whole quarry force is employed in removing the tracks and replacing them later. The shovel loads the rails and the bundles of ties slung together with chain, onto the quarry cars, which are moved away to a safe distance. Following the blast and after the shovel has cleaned up the loose stone, the track is replaced.

Loading

The steam shovel is a 100-B, full-circle, caterpillar-type Bucyrus with a 3-yd. dipper. It loads the stone into 12-yd. Western side-dump cars which are hauled by an 18-ton Vulcan steam locomotive to the primary crusher. The shovel crew consists of one operator, one fireman and one pitman. The one shovel handles the quarry output of 1000 to 1500 tons per day. The steam shovel is being replaced by a Marion electric shovel, type 4160, mounted on crawling traction trucks, equipped with 34-ft. steel boom, 21½-ft. dipper stick and 4-cu. yd. dipper, and operated by 2300-volt, 3-phase, 60-cycle alternating current. The steam shovel is to be transferred to another quarry of the company, where the tonnage handled is somewhat less.

A shovel of the electric type was deemed desirable for several reasons, the principal ones being cheaper operation and the ease of bringing power to the shovel and keeping it in repair.

Upon arrival at the primary crusher the loaded cars are dumped by means of a com-

pressed-air cylinder, which hooks and lifts one side of the car, dumping the stone into the crusher. The layout of the crushing plant (not including grinding mills) is shown in Fig. 3.

Transportation

The track in the quarry is laid directly on the quarry floor and is not ballasted. The men who do the secondary drilling and blasting also maintain the track. Little work is required for routine maintenance, probably only a few man-hours in a month.

Although the plant of the quarry (Fig. 2) shows the quarry track as a loop, the full loop is not used at present. The locomotive approaches the shovel with empties from the east and removes these cars to the east after they are loaded. After the removal of the four loaded cars from the shovel the locomotive must take them to the crusher and pick up empties to serve the shovel, hence the shovel is idle for about 10 min. while waiting for the empties.

In present practice the locomotive is always on the crusher side of the loads at the shovel, but at the run-around switch at the crusher it shunts them by and getting on the shovel side of the loads, pushes them beyond the crusher and picks up a train of four empties. The locomotive is then between the loaded cars and the empties, and starting for the shovel with the empties on the shovel side, drops the loaded cars at the crusher where a car puller operated by compressed air places the cars for dumping.

The loop track will be placed in use within a few weeks. The locomotive will then handle trains in cars of three, approaching the shovel from opposite sides alternately, and pushing a train of loads away as it places a train of empties. In this way there will be no lost time at the shovel. Three trains of three cars each will be used, and while a train is in transit, there will be a train at the shovel and another at the crusher. This change in practice will involve no changes in track layout other than some grading on the storage track beyond the crusher, so that empties can be dropped down for the locomotive.

In moving the track serving the working face the track is taken apart in sections about 150 ft. long, and the shovel lifts the track to its new position. It makes the first move of the track from its position on the quarry-face side of the track, then moves through the opening between the sections of track to the outside of the track. The work is completed from the outside, except that an opening large enough for the shovel to pass is left, and this is closed after the shovel is again between the track and face.

Crushing and Screening

The 1500 tons of stone (plus overburden) quarried per day passes successively through a gyratory crusher, a large hammer mill and a small hammer mill. About 150 tons of clay is added at this point and passes through the ball mills and the tube mills with the stone, each of the two ball mills handling about half the total tonnage and each of the four tube mills handling about one-quarter of it. There is no sizing during the process, except that a screen with ⅝-in. openings removes about one-third of the discharge of the large hammer mill as undersize which by-passes the small hammer mill. However, upon completion of the new screen equipment the stone-clay-water slurry will be screened at the ball mills.

SCREEN ANALYSIS OF MILL DISCHARGE

Per cent. passing	No. 7 hammer-mill discharge = ball-mill feed	Ball-mill discharge = tube-mill feed
200-mesh	....	51.0
100-mesh	11.1	55.8
80-mesh	12.5	57.4
60-mesh	14.2	59.4
50-mesh	16.4	62.2
40-mesh	20.1	66.4
30-mesh	24.2	71.2
20-mesh	41.2	79.4
10-mesh	47.0	93.8
6-mesh	63.5	....
4-mesh	....	100.0
⅜-mesh	88.5	....
¾-mesh	100.0	....

The machines used for crushing and grinding, with the approximate size of reduction and the rate of output for each, are listed below. The output figures for slurry are based on weights of dry material and do not include the weight of water.

MACHINES USED FOR CRUSHING AND GRINDING, SHOWING APPROXIMATE SIZE OF REDUCTION AND RATE OF OUTPUT FOR EACH

Machines	Entering	Leaving	Output, tons per machine per hour
1 No. 24 Gates type gyratory crusher.	4 ft. and under.	8 in. and under.	*104
1 No. 9 Williams hammer mill.	8 in. and under.	1½ in. and under.	*104
1 No. 7 Williams hammer mill.	1½ in. and under.	⅝ in. and under.	†70
2 Allis-Chalmers ball mills, 8 ft. diam., 7 ft. long (preliminators)	⅝ in. and under.	94% passing 10-mesh sieve.	‡31.9
4 Allis-Chalmers tube mills, 7 ft. diam. by 16 and 20 ft. long.	97% passing 10-mesh sieve.	90% passing 200-mesh sieve.	‡15.4

*Approximate average output in 1930; figures do not represent capacity of machines, but average output.

†Estimated average output; about one-third the material by-passes this mill through the screen.

‡Average output in 1930.

Note—The gyratory crusher and the two hammer mills crush stone (plus overburden); the two ball mills and four tube mills grind slurry (stone-clay-water). The output figures for these grinding mills are based on weights of stone and clay without water; the proportion of stone to clay is about 9 to 1.

The output figures for the ball mills and tube mills are based on the mill hours operated and tons ground for the year 1930. The outputs per hour for these mills are not comparable to those for the gyratory crusher and hammer mills for the reason that the grinding mills operate day and night, as needed to maintain stocks of ground material for the kilns, whereas the crusher and hammer mills operate in the day only. The slack is taken up by the concrete stone storage bin after No. 7 hammer mill, by the open storage served by a Whiting electric crane, and by the preliminator (ball mill) feed bins. There is no storage between the ball mills and the tube mills, so the tube mills must operate when the ball mills operate. The operating ratio is usually two tube mills to one ball mill, but sometimes with one ball mill running, three tube mills are run in order to maintain the fineness of hard grinding material. This will account for the slight discrepancy between the total of 61.6 tons per hour for the four tube mills and the 63.8 tons for the two ball mills.

The gyratory crusher is a No. 24K Gates Allis-Chalmers crusher and is belt-driven by a 200-hp. induction motor. The larger hammer mill is a No. 9 Williams Mammoth, Jr., and is driven at 870 r.p.m. by a direct-connected 500-hp. slip-ring motor.

The smaller hammer mill is a No. 7 Williams New Type and is driven at 1170 r.p.m. through a direct drive by a 200-hp. slip-ring motor. This mill is preceded by a 2-deck James Duplex vibrating screen, with screens 4 ft. wide and 7 ft. long. The upper deck is for heavy screening and scalping, and the lower deck for producing the finished product. The stone passing through the lower deck is about one-third of the total tonnage handled by the screen, so that the material retained on the screens and going from them to the hammer mill is about two-thirds of the total tonnage. The stone leaving the small hammer mill and that passing through the screen is carried away by a belt conveyor.

Grinding

The following table gives operating data for the grinding mills during 1930 when 312,700 tons of slurry (not including weight of water) was ground:

OPERATING DATA FOR GRINDING MILLS, 1930

	Ball mills	Tube mills
Approximate ball load, lb.	24.000	50,000
Diameter of balls, inches	4	⅞
Total weight of balls, worn out, pounds	....	319,305
Total cost of balls	....	$13,922
Weight of balls worn out per ton of ore ground, lb.	....	1.021
Cost of balls per ton of ore ground	....	$0.0445
Cost of replaced liners	$281.00	$4,701.00
Cost of replaced liners per ton of ore ground	$0.0009	$0.0150

No ball consumption is shown for the ball mills. There was an unknown quantity of old balls used, balls that were not carried on the stores card and which were thus not charged to the ball mills when used. Hence there is no way of computing the consumption.

The cost figures represent the cost of the balls and liners only and do not include

labor. Ten end liner plates and no side plates were put in the ball mills. Seventeen end liner plates and two complete sets of liner plates were put in the tube mills.

The two ball mills are Allis-Chalmers preliminators, 8 ft. in diam. by 7 ft. long. One mill has been equipped with a rotary trommel screen, the oversize from which passes to an elevator to be returned to the mill. This trommel screen will be removed, however, as two 8-ft. type 42 "Hum-mer" screens are being installed to serve the two preliminators. As mentioned before, clay and water are added to the stone as it enters the preliminators, and the "Hum-mer" screens will handle this slurry. The slurry passing through the screens will go directly to the tube mills, while the oversize will be returned to the preliminators for further grinding. Each preliminator is driven at 20 r.p.m. through a countershaft, pinion and gear, by a 200-hp. synchronous motor.

The four tube mills are of Allis-Chalmers make, 7 ft. in diam.; two are 16 ft. long and two are 20 ft. long. Each tube mill is driven at 21.8 r.p.m. through a countershaft, pinion and gear, by a 300-hp. induction motor.

As stated, grinding of the stone with clay is done to reduce and mix the materials preparatory to burning to cement clinker. Although no grading for sizes is done, close control of the fineness of the slurry leaving the tube mills is effected by means of sieve tests made at hourly intervals. Coarse particles are detrimental to easy and complete combination of the components during burning. The fineness of the slurry leaving the tube mills is regulated by controlling the rate of their feed. The fineness of the slurry is kept at or above 90% passing a 200-mesh sieve.

The chemical composition of the raw material is kept under strict control. Samples of the slurry leaving the tube mills are analyzed hourly for their calcium-carbonate content. Chemical control of materials extends from the quarry through the various plant departments, but it is not necessary to describe it here. The proper composition of the raw materials is attained by the following controls:

Quarrying stone that is suited for the cement mixture.

Blending of crushed stone in the open storage.

Use of proper amounts of clay, varying the quantity to suit composition requirements.

Blending of slurry in tanks by mechanical and air agitation.

The material-handling equipment and practice are summarized as shown below.

The electric power used by the motors is 3-phase, 60-cycle, 440-volt alternating current. The air compressor serving the quarry is a 750 cu. ft. Chicago Pneumatic machine driven by a 130-hp. synchronous motor.

From	Means of transportation	To
Quarry face.	One 18-ton Vulcan steam locomotive, 4-wheel, saddle-tank, hauls quarried stone ½ mile in 12-yd. Western, side-dump cars in trains of four cars over standard-gage track; rails, 60 lb. per yd.; maximum grade, about 1%.	Gyratory crusher.
Gyratory crusher.	One belt conveyor, with belt 40 in. wide and 130 ft. between centers, conveys crushed stone.	No. 9 hammer mill.
No. 9 hammer mill.	One belt conveyor, with belt 30 in. wide and 133 ft. between centers, conveys crushed stone.	No. 7 hammer mill.
No. 7 hammer mill.	One belt conveyor, with belt 30 in. wide and 261 ft. between centers, conveys crushed stone.	Concrete stone storage bin.
Concrete stone storage bin.	One 40-ton Porter steam locomotive, 4-wheel, saddle-tank, hauls crushed stone about 4000 ft. in 40-ton steel hopper cars in trains of two cars over standard-gage track; rails, 67 and 80 lb. per yd.; maximum grade, about 2%.	Open storage.
Open storage.	One Whiting electric crane, 3 yd. capacity, span 80 ft., powered by four motors, handles stone in storage and reclaims it from storage (this crane also serves cement-clinker and coal storages). It delivers to one 24-in. by 153-ft. belt conveyor, which in turn delivers to the 20-in. by 220-ft. belt conveyor that delivers to the ball-mill feed bins.	Ball mills (preliminators).
Clay quarry.	One 40-ton Porter steam locomotive (used also for hauling stone) hauls clay about 1500 ft. in 6-yd., Western, side-dump cars in trains of three cars over standard-gage track; rails 67 and 80 lb. per yard; maximum grade, about 2%.	American clay machine.

Note—Water is added to clay in the clay machine and the clay in suspension is pumped to storage tanks by a centrifugal pump. It runs by gravity, as needed, to the two ball mills, where it meets the stone and where more water is added. The slurry consists of about 57% of stone, 5% of clay and 38% of water.

Ball mills (preliminators).	Two Link-Belt chain-and-bucket elevators, with 8 by 8 by 16 in. buckets, receive the slurry (stone-clay-water) from the trough leading from the two ball mills, and deliver it to a 40-ft. Smidth horizontal mechanical agitator which feeds it to the four tube mills.	Tube mills.

Clay Handling

Clay-quarrying operations are simple, and a few words will suffice to describe them. Clay is used as a source of silica, iron and alumina for the cement mix. The clay is soft and plastic with no sandy material and but little loam. One ¾-yd. full-revolving, caterpillar-type, Osgood steam shovel is used. The dipper noses into the clay bank and tears out the material which it loads into 6-yd. Western side-dump cars. The clay is hauled by steam locomotive to the 10-ft. American clay machine, where water is added and the clay broken. The suspended clay is pumped to storage tanks, whence it runs by gravity to the preliminaries as needed.

Safety and First-Aid Work

In discussing the subject of safety and first-aid work it is difficult to separate safety activities in the quarry from those of the plant as a whole, but the following statements are applicable to the quarry in that it is one department of the cement plant.

There is a plant safety committee, made up of all plant department heads, which meets monthly to discuss safety and first-aid matters. There is another group known as Distinguished Safety Workers Club, made up of 12 workmen who have shown outstanding interest in safety work. This group meets monthly and is presided over by the chairman of the plant safety committee. Each second Saturday a departmental safety meeting is held, at which a workman gives a talk on safety and dangerous and unsafe practices are discussed and suggestions made for their elimination. A good-housekeeping campaign, with regular inspections, is carried on in all plant departments.

Some time ago a first-aid instructor from the U. S. Bureau of Mines visited the plant and trained selected men in first-aid, and the bureau first-aid methods are used at the quarry and throughout the plant. The men first trained in this work have in turn acted as instructors for other men of the plant organization until now 40 of the 150 men employed at the plant have had first-aid training. There are two first-aid teams in the plant, made up of the men most proficient in this work, and it is planned to have these teams compete.

Quarry Organization and Scale of Wages

A list of men employed at the quarry will suffice to indicate the quarry organization and includes the following:

1 quarry foreman.
3 well drillers.
1 shovel operator.
1 shovel fireman.
1 shovel pitman.
1 blaster.
1 locomotive engineer.
1 gyratory-crusher operator.
1 jackhammer driller.

1 hammer-mill operator (for 2 mills).
1 conveyor-belt operator.
1 blacksmith.
1 blacksmith's helper.
2 car repairmen.
1 night watchman.

The total quarry force, including employes of the crushing department but not those of the grinding department or clay quarry, is 18 men. The foreman is paid a monthly salary and the workmen are paid on an hour basis, their rates of pay varying from 40 to 73 c., with an average of 53 c. an hour. There is no contract or bonus system used. The quarry normally is operated 10½ hr. a day, in daylight only, and about 270 days a year. The quarry is usually closed on Sunday and there is a shutdown of some weeks during the winter.

Costs

The costs of quarrying stone, crushing stone, quarrying clay and grinding stone plus clay given in the following table are based on operations for the full year 1930.

QUARRY COSTS FOR DRY STONE—YEAR OF 1930; STONE QUARRIED, 281,400 TONS

	Per ton
All labor	$0.0988
Supplies other than power, fuel and explosives	0.0394
Electric power	0.0061
Coal (shovel and locomotive)	0.0166
Explosives	0.0499
Stripping	0
Total cost	$0.2108

COST OF CRUSHING DRY STONE (BEFORE ADDITION OF CLAY) IN GYRATORY CRUSHER AND TWO HAMMER MILLS—YEAR OF 1930; STONE CRUSHED, 281,400 TONS

	Per ton
All labor	$0.0371
Supplies other than yower and fuel	0.0436
Electric power	0.0178
Coal for locomotive hauling	0.0047
Total cost	$0.1032

COST OF QUARRYING CLAY—YEAR OF 1930; CLAY QUARRIED, 31,300 TONS

	Per ton
All labor	$0.0835
Supplies other than power and coal	0.0118
Coal for shovel and locomotive	0.0178
Total cost	$0.1131

COST OF GRINDING SLURRY (STONE PLUS CLAY)—YEAR OF 1930; MATERIAL GROUND, 312,700 TONS

	Per ton
All labor	$0.0613
Supplies other than power	0.0797
Electric power	0.1398
Total cost	$0.2808

Labor for grinding includes wages of clay-machine operator, belt-conveyor operator, etc.

MAN-HOURS PER UNIT OF PRODUCTION—YEAR 1930; STONE, 281,400 TONS; CLAY, 31,300 TONS

Quarry: Man-hours per ton of stone quarried	0.169
Crushing: Man-hours per ton of stone crushed	0.073
Clay: Man-hours per ton of clay quarried	0.168

Asphalt Institute Expands

WITH a substantial increase in its membership, seven more oil companies having recently joined its ranks, the Asphalt Institute, New York, N. Y., trade organization of the asphalt producers, will soon extend its activities to the Pacific Coast with a branch office in San Francisco. Up to this time the institute has confined its educational, research and promotional activities to the territory east of the Rocky Mountains, its membership having been confined to that section of the country.

The new companies which have joined the institute are the Standard Oil Co. of California, the Union Oil Co. of California, the Shell Oil Co. of California, the Associated Oil Co. of San Francisco, the Gilmore Oil Co. of Los Angeles, the Colonial Beacon Oil Co. of Boston and the Indian Refining Co. of Lawrenceville, Ill. The probabilities are that several more companies will join the institute during the next few months.

"Now that we have a membership ranging from coast to coast," said Mr. Pennybacker, managing director, in discussing the expansion of the institute, "we shall materially increase the magnitude and scope of our work. Our activities will now be of a nation-wide character and therefore will be more complete and effective, not only in connection with the standardization and simplification work being carried on with the United States Bureau of Public Roads and the state highway departments, but our activities now will enable the asphalt industry more as a whole to move forward expeditiously and effectively in eliminating trade abuses for the benefit of both the producers and the users of asphalt. The increased membership necessitates a branch office in San Francisco to handle those matters directly affecting the Pacific Coast.

On account of the present industrial depression, we shall omit for this year the Annual Asphalt Paving Conference, as we feel that engineers and public officials might find the expense of attending a convention this year somewhat burdensome. We are planning a much more extensive program for 1932, however, including a bigger and better conference. There will be keen competition, for the new California members are organizing a strong movement to bring the next, or tenth, Annual Asphalt Paving Conference to Los Angeles, the sessions being scheduled to follow the Olympic Games which are to be held in that city in 1932."

Gypsum in 1930

STATISTICS on gypsum in 1930 have been issued by the U. S. Bureau of Mines. This is a preprint of data to be included in "Mineral Resources of the United States, 1930"—Part II.

Promoting Cement Plant in California

WHAT IS HERALDED as a six million dollar corporation for the purpose of manufacturing quick hardening portland cement and other products is considering a location at Los Nietos, Calif. It is stated that when in operation the proposed plant will employ at least 1000 men practically throughout the year.

Already two meetings have been held with the industrial committee of the Montebello chamber of commerce at which representatives of the proposed corporation have been present. At a meeting held October 2 and attended by Aman Moore, one of the organizers of the company, it was stated that the directors of the new company have limited their choice of sites to two locations, one at San Pedro and the other at Los Nietos. The Los Nietos site is composed of approximately 100 acres. Options are held now on the three parcels of land comprising the desired acreage.

According to Mr. Moore, the selection of the site will be largely influenced by the action of capitalists and other interested parties in cooperating with the company. It was intimated that should the land at Los Nietos be cleared, there would be no question but that the company would elect to bring its plant here. The plan for clearing the land seems to be the sale of debentures, which would run for ten years, and which might be paid at the end of 18 months. About $75,000 in debentures must be subscribed to insure the location of the plant in this district.

The industrial committee is investigating the proposition and has already expressed itself as willing to cooperate in any manner possible.

The proposed company will manufacture, in addition to quick hardening cement, lime, plastic waterproof white portland cement, marine portland cement, hydrated lime, plaster, and dry ice.—*Montebello* (Calif.) *Pico-Rivera News.*

Find Limestone Strata in Clay County, Indiana

A STRATUM of limestone, said to be the same as the famous Indiana limestone in the Bloomington and Bedford field, 400 ft. thick, was penetrated by drillers prospecting for oil northwest of Brazil, Ind. The stone is located about 300 ft. below the surface and an effort will be made to determine if it can be taken out on a paying basis. The drillers are going through a stratum of shale and expect to find another vein of limestone, known as the Niagara, where they hope to find oil-bearing stratum. The limestone possibilities of Clay county were written upon at length some time ago by the late C. W. Crawford, who wished to interest capital in the local field.—*Terre Haute* (Ind.) *Star.*

Manufacture of Hydraulic Cement

A Review of the United States Patents for the Making of Hydraulic Cements

By Joseph Rossman

IN THE manufacture of portland cement the dry process, in which the cement making materials are ground dry, burned and then reground into cement, has been generally used.

Another process has also been used, known as the wet process, in which the materials are ground wet with sufficient water to form a slurry. This is done either by adding water to the cement forming materials or by permitting it to remain when originally present, as in the case of marl. After grinding in the form of slurry the cement making materials are fed in their moist condition to the kiln where the moisture is first evaporated and the materials then burned to a clinker, after which they are pulverized to a powder.

The patented processes for making portland and other hydraulic cements are given in the following abstracts of United States patents:

Editor's Note

IN THIS ARTICLE the author has reviewed and briefly abstracted those United States patents relating to the manufacture of portland and other hydraulic cements.

With the exception of one patent noted in 1837 and four in the decade, 1870-80, practically all of the 102 patents listed were granted during the past 50 years.

—The Editor.

1. *Warner 371. October 6, 1837.* The mineral basanite is burned in any convenient mass, in the manner of burning lime in kilns, in layers of wood and coal with the mineral on the top to a red heat, which may be continued six or eight hours. After cooling the mineral is cracked and reduced to a fine powder. It is then mixed with water to a proper consistency for application.

2. *Saylor 119,413. September 26, 1871.* This invention consists in the discovery that some kinds of the argillo-magnesian and argillo-calcareous limestone found along the Appalachian range, containing more or less carbonate of lime, magnesia, silica, alumina, iron, salts and alkalies are adapted for manufacturing hydraulic cement. When they are burned to a stage of incipient vitrification, so as to be agglutinated, warped or cracked by contraction, a very superior and heavy hydraulic cement weighing from 110 lb. to 120 lb. per bushel, and in every respect equal to the portland cement, will be produced.

3. *Saylor 126,989. May 21, 1872.* This invention relates to a method of treating the argillo-magnesian limestone found along the Appalachian range of mountains, which is used for manufacturing hydraulic cement, containing carbonate of lime, magnesia and alumina. The limestone is first burned and crushed in the ordinary manner employed in the making of cements. About one-fifth of its weight of raw stone ground to an impalpable powder is next added to it and the whole mass ground together.

4. *Cummings and Bennett 205,616. July 2, 1878.* The method of producing hydraulic cement by disintegrating the properly calcined and the vitrified stone, then separating the vitrified portion from the former and separately reducing it to powder, and, lastly, reincorporating it with the former.

5. *Brown 222,004. November 25, 1879.* Molding or forming the mixed raw materials required for the manufacture of artificial hydraulic or portland cement into hollow cylindrical portions or perforated spherical balls for the purpose of a more economical and uniform calcination.

6. *Jordan 231,172. August 17, 1880.* A cement compound composed of silica, oxide of iron and alumina combined with lime, soda, potash, magnesia and alum tempered with refuse from gas works or tanneries.

Several Early Patents by De Smedt

7. *De Smedt 274,288. March 20, 1883.* The improvement in manufacturing portland cement by mixing with the paste from which the cement is to be made a combustible such as coal tar or petroleum oil, then making up this compound into bricks or other suitable forms and subjecting same, while moist, to the process of calcination.

8. *De Smedt 274,734. March 27, 1883.* Cement rocks or hydraulic limestones or both are ground raw. The chemical composition of the ground mass is analyzed to determine the deficiency in lime. Lime is then added in such proportion as to make the manufactured portland cement analyze about 70% of lime, or lime and magnesia. After the addition and incorporation of the lime the mass is moistened, made into bricks or other forms, dried, calcined to a clinker and ground into cement.

9. *De Smedt 274,735. March 27, 1883.* The manufacture of portland cement, consisting in combining with cement rocks or hydraulic limestones dolomite in such proportion as to make the manufactured cement analyze about 70% of lime and magnesia.

10. *De Smedt 275,369. April 10, 1883.* A cold, slow-setting hydraulic cement composed of not more than 50% in bulk of a slaty or silicious non-cement-producing rock, such as the rock of the Potomac strata, in combination with not less than 50% in bulk of one or more of the hot, quick-setting cement-producing rocks in common use in the manufacture of cements, whether the combination of raw materials be calcined together in mass or mixed after separate calcination, or the slaty or silicious non-cement-producing rock be added in a raw state after the other rock or rocks have been separately treated to calcination, the relative proportions within the limit specified varying in proportion to the degree of cold or slow-setting quality desired.

11. *De Smedt 279,357. June 12, 1883.* Making portland cement by first calcining the raw or natural rock to be used in the manufacture of the cement, then grinding or reducing it to a powdered condition, then forming a cement-paste from it and finally recalcining and regrinding it.

12. *Lesley 305,201. September 16, 1884.* The process of manufacturing portland cement by combining lime or lime and magnesia in any of their forms with slate and subsequently calcining the compound to a clinker and then grinding it.

13. *Lesley 305,753. September 30, 1884.* The method of making a slow-setting hydraulic cement by mixing quick-setting cement rocks and ferruginous earths or stones and then calcining and grinding to a powder.

14. *Loiseau 309,150. December 9, 1884.* The granulation of cement powder before the molding operation by the addition thereto of binders or wedges of larger size than the grains composing the powder and composed of coke dust, coal, culm or raw cement or limestone.

15. *Griffiths 311,895. February 10, 1885.* Cement rocks and hydraulic limestones are calcined in the manner ordinarily practiced for the production of natural hydraulic cements. To these calcined rocks about 5 to 7½% of raw cement rock and 2½ to 5% of slaked lime are added. The addition of these ingredients may be effected either before, during or after the operation of grinding the calcined rocks to a powder.

16. Lesley 313,217. March 3, 1885. The manufacture of hydraulic cement by incorporating with calcined cement rocks or hydraulic limestones, black chalk, found principally in Lehigh county, Pennsylvania, having a greasy texture and hardening when exposed to the air. Chemically it contains varying proportions of silica, alumina and lime and a considerable proportion of iron.

17. Bryce 315,711. April 14, 1885. The method of manufacturing hydraulic cement by grinding together limestone and Leitchfield marl or shale, then compressing it into bricks and burning and grinding.

18. Lesley and Griffith 321,120. June 30, 1885. The process of destroying the clinker bridge formed in a kiln during the calcining operation by directing against the under face of the bridge a current of cold air to effect the cooling and consequent contraction and breaking down of the bridge.

Steps in the Process of Evolution

19. Dimelow 321,589. July 7, 1885. The method of preparing hydraulic cement from decomposed refuse limestone and the deposits of rivers or similar material, by burning the refuse limestone, pulverizing it, mixing it with the deposits of rivers, soaking the mixture in water, grinding it, sifting it, evaporating the water, burning in a furnace and finally grinding the material to powder.

20. Mathey 330,602. November 17, 1885. Making hydraulic cement by first grinding the cement rock or material to a fine powder and then calcining this powder.

21. Willcox 333,370. December 29, 1885. The method of making hydraulic cements by mixing with the powdered cement-making material a binding medium, such as pitch, which will soften and become fluid when heated and will harden when cooled, then molding the mixture by compression into balls and subsequently calcining them and again reducing them to powder.

22. Mathey 339,673. April 13, 1886. The process for making cement which consists in crushing the rock to a suitable fineness, then subjecting it to sufficient heat to calcine it and finally pulverizing the calcined material.

23. Mathey 343,183. June 8, 1886. Manufacturing and coloring cement by preparing the cement-rock for final pulverization, adding to it a metallic oxide roasted separately from the rock, then pulverizing the rock and oxide together.

24. Anderson 346,525. August 3, 1886. The production of hydraulic cement from ordinary cement or limestone rock by immersing it in a solution of acetic acid and afterward calcining it.

25. Eagan 387,199. July 31, 1888. A composition of the following ingredients combined in the proportions stated is made. Lime-rock, 65%; silex, 15%; mineral magnesite, 10%, and alumina, 10%. The substance designated as lime-rock is a rock containing carbonate of lime, magnesia, sesquioxide of iron and alumina. By mineral magnesite is meant a mineral composed of magnesia, carbonic acid, silica and usually some ferro-oxide. These products are crushed and ground dry, and thoroughly mixed. A small proportion of water is then added and the moistened powder formed into bricks which are placed in a drying-kiln and burned at a high degree of heat. The calcined product is then ground to a powder.

26. Gostling 387,588. August 7, 1888. The manufacture of hydraulic cement by crushing and grinding the materials of which the cement is composed, mixing the ground mass with water and regrinding the plastic or semi-plastic mass to still further reduce it. It is then dried, after which it is burned and ground.

27. Cummings 402,511. April 30, 1889. The object of this invention is to produce a hydraulic cement practically free from alumina, and it is therefore produced from the silicate of magnesia, either natural or artificial. This rock is calcined in kilns and then ground in the usual way. In calcining ordinary cement rocks or mixtures a large quantity of heat is consumed in expelling the carbon dioxide from the carbonates of lime and magnesia. As the silicate of magnesia contains practically no carbonate, no heat is required for the decomposition of the carbonate and expulsion of carbon dioxide, but only as much heat is required as is necessary to expel the water of crystallization. The cement so produced from the single silicate of magnesia has all the useful qualities of an efficient hydraulic or portland cement, and is much more durable in sea-water, while it is produced in less time and at less cost.

28. Willcox 420,371. January 28, 1890. The method of burning or reducing the cement-making materials by subjecting them to the simultaneous action of the usual solid fuels previously mixed with the cement-making materials and of auxiliary burning jets of gas, fluids or spray applied to the upper strata of the charge in the kiln before or at about the time the lower strata of the same charge are lighted.

29. Trump and Peck 427,380. May 6, 1890. In the manufacture of portland cement the establishing of units of measure in the separate ingredients by molding or cutting each ingredient separately into definite forms of uniform sizes.

30. Joy 434,830. August 19, 1890. The manufacture of cement by separately depositing at different times quantities of a mixture of slurry and fuel and quantities of neat slurry on the burning mass in a partly-charged kiln as the burning proceeds.

31. Baum 446,911. February 24, 1891. The process of manufacturing portland cement by uniting wet marl with quicklime (CaO) whereby the mixture is rendered perfectly dry preparatory to grinding.

32. Williams 449,510. March 31, 1891. Making hydraulic cement by reducing carbonate of lime to a powder by steam, under pressure, produced from a solution of silicate of soda and water, adding to the powder so produced alumina and silex and a thin paste of chloride of calcium, unslaked lime and warm water, molding it into convenient forms which are burned to a white heat to produce a clinker, which is then ground.

33. Speed 450,750. April 21, 1891. Manufacturing hydraulic cement by first reducing the rock to lumps of varying sizes, then separating such lumps into groups of approximately uniform size, then charging the several groups of lumps separately into the kiln with the fuel and finally firing the kiln.

34. Wright 460,697. October 6, 1891. The manufacture of hydraulic lime by combining with unslaked lime crude potash, crude soda-ash, alum, sulphate of lime and water.

35. Navarro 464,515. December 8, 1891. The process of manufacturing portland cement by first burning the raw unground rock in a vertical stationary kiln, pulverizing the burned product, then adding any required additional element, then vitrifying or calcining the pulverized material in a rotating horizontal kiln and finally pulverizing the product.

36. Navarro 464,516. December 8, 1891. Manufacturing portland cement by grinding to a powder in a dry state argillaceous rock containing the chemical constituents of portland cement, then adding, when deficient in lime, a definite proportion of ground cement-rock high in lime or pure limestone, then burning the mixture in a rotating kiln and finally grinding the resultant clinkers to a powder.

A Long Way Around

37. Dentler 511,938. January 2, 1894. The manufacture of cement by burning stone to quicklime, slaking it with a solution containing carbonate of potash and sulphate of copper, making bricks from the slaked material, drying them, subjecting the dried bricks to a white heat, exposing them to dry cool air until they become brittle, reducing them to powder and finally mixing the powder with sulphate of iron.

38. Lesley 582,068. May 4, 1897. Producing slow-setting artificial portland cement by treating the cement-making material after calcination, whether in the form of clinker or powder with a dilute sulfuric acid. This solution is sprinkled over the batch of clinker after calcination and before or during the grinding.

39. Fahrney 590,057. September 14, 1897. The material to be calcined is formed into a tube, which is fed into the escape-passage of the furnace as fast as the end in the furnace is calcined or otherwise reduced by the action of the heat and disintegrates and falls into a suitable receptacle or chamber.

40. Kjeldsen 592,492. October 26, 1897. The method of manufacturing cement consisting in adding to the raw cement material a small quantity, say, from 3 to 5% of manufactured cement, forming this compound into blocks and subsequently burning the

blocks and grinding the product. This cement is proof against the effects of the weather.

41. Merceron - Vicat 655,501. August 4, 1900. The process consists essentially of the calcining and fusion of a natural marly limestone or of a prepared mixture of calcareous matter and clay. The product thus obtained is granulated and when mixed with slaked lime by known processes gives a hard-setting cement. The operation comprises two consecutive stages, the decarbonization of the calcareous element and afterward the fusion, and should be carried out preferably in two separate and consecutive furnaces.

42. Moller 678,748. July 16, 1901. The manufacture of solid pieces of raw cement by drying the plastic raw cement and successively bringing pieces of the dried cement into contact with newly-mixed plastic mass until the pieces have reached the desired size and are ready for the baking process.

43. Warren 688,910. December 17, 1901. Manufacturing cement by forming the materials into a liquid sludge, separating and confining portions of the sludge, incorporating a granular fuel with the sludge while in a liquid condition, drying the separated and confined portions of sludge to form blocks and burning the blocks.

On the Way to Present Practice

44. Rusager 718,729. January 20, 1903. The process of making cement by grinding separately the raw ingredients in their natural, humid state, dissolving one of the ingredients in a small quantity of water, simultaneously grinding and mixing the remaining ingredients with the solution so as to form a sludge of a creamy consistency, calcining the resulting sludge to clinker and pulverizing the clinker.

45. Gresly 748,943. January 5, 1904. Producing hydraulic cements by burning artificial mixtures of aluminium silicates with lime, especially in the form of carbonate, with a slight addition of sulfate of calcium. These are combined so that the lime molecules, CaO, are equal to double the number of acid molecules, SiO_2 and Al_2O_3, the burning being effected below the sintering temperature.

46. Geissler and Geissler 764,453. July 5, 1904. The solid mixture of raw materials required for the production of a good serviceable cement are totally smelted in a suitable furnace without being previously ground or otherwise treated. This transforms the substance so that a liquid homogeneous mass is produced. While the fusing or smelting process is being performed oxygen of as pure a quality as possible is introduced, producing a high degree of heat (2500 deg. to 3000 deg. C.), which considerably increases the hydraulic qualities of the cement. The smelting time is greatly reduced and the fuel required for such operation is completely utilized. After the mixture has been reduced to a molten mass it is granulated by being run into cold water.

To Make White Cement

47. Gogler 774,840. November 15, 1904. The method of making white cement by finely grinding lime and quartz-sand or pure silicic acid, both as free as possible from iron combinations, mixing these materials in the proper proportion with the addition of a quantity of carbonates of alkalies of from one to three times the weight of the silicate contained in the mixture, making from the whole mixture a raw cement mass, melting the raw cement mass, disintegrating or granulating the molten product, lixiviating the disintegrated or granulated mass in boiling water until its percentage of alkalies is reduced to the proper amount, completely drying the mass at a weak red heat, and finally grinding it.

48. Hurry 806,146. December 5, 1905. The process of making portland cement by mixing carbonate of lime, argillaceous matter containing silica and alumina, and coal or coke, maintaining the combustion of such fuel under high temperature and pressure by means of an air-blast, thereby disassociating the carbon dioxide from the carbonate of lime, in the presence of the highly-incandescent fuel, melting the cement materials, drawing off the molten cement material and cooling and pulverizing it.

49. Michaels 806,161. December 5, 1905. Manufacturing a hydraulic cement with heavy metals as a base by comminuting and mixing silicious peroxide containing ores of heavy metals of the iron group and ore residues practically free from alumina with silicious lime, burning the mixture to incipient fusion and in the presence of an excess of air, grinding the product and mixing it with ordinary cement mixtures in any form or condition.

50. Clark 811,902. February 6, 1906. The method of making hydraulic cement by hydraulically classifying the tailings from concentrating or other mills, treating ores with an aluminous silicious gangue, mixing them with a calcareous substance, reducing the mass to powder, burning the mixture to a clinker, and pulverizing the clinker.

51. Von Mollenbruck 844,530. February 19, 1907. Manufacturing cement by first mixing cementitious material with fibrous material and then grinding the mixture.

52. Edison 861,241. July 23, 1907. The process of making portland cement by subjecting the clinker to a single crushing operation, removing the fine particles, and finally recrushing the tailings with an added mass of fresh material.

53. Spackman and Lazell 903,019. November 3, 1908. This invention relates to the preparation of highly cementitious materials by the addition of separately prepared calcium aluminate or similar accelerating material with hydraulic independently cementitious material such as natural cement compositions.

54. Harding 908,092. December 29, 1908. The method of making portland cement by charging fragmental lime rock and cement rock into an upright kiln of the Rosendale type, with a layer of coal for each layer of rock, the amount of the coal and the rate of combustion being proportioned so as to effect calcination of about ⅔ to 9/10; grinding and mixing the burned material and preparing therefrom a mixture containing lime, silica, and alumina in proportions suitable for cement burning; burning the material in a rotary kiln, and controlling the time of clinkering by regulating the feed and speed of the kiln.

55. Harding 908,093. December 29, 1908. The method of making portland cement by separately calcining fragmental lime rock and cement rock, controlling the fuel and the proportions of the different rocks, grinding the product and preparing therefrom a mixture containing lime, silica, etc., in proportions suitable for cement; and clinkering the material in a rotary kiln.

56. Harding 908,094. December 29, 1908. Making portland cement clinker by calcining lime rock to make lime, grinding the lime, and mixing it with clay in suitable proportions to constitute a cement forming material, the clay being dried and pulverized, but not freed from the associated water of hydration; and reheating and clinkering the material in a rotary kiln.

57. Jones 916,165. March 23, 1909. The method of preparing a cement by adding tribasic aluminum sulfate to gypsum rock, calcining the admixture to a red heat, crushing the residuum to powder, preparing potassium bisilicate, subjecting the potassium silicate to the action of sulfuric acid so as to form potassium sulfate, reducing the potassium sulfate to the form of a dry powder and admixing the potassium sulfate with the first-mentioned powder.

Two Well-Known Names

58. Lesley and Spackman 929,145. July 27, 1909. The cement making process which comprises coarsely crushing raw cement material, continuously calcining the crushed material in a rotary kiln, cooling the calcined material in a rotary cooler and thereby heating a supply of air to aid combustion in the kiln, finely grinding and mixing the calcined material, continuously feeding it through a rotary clinkering kiln, the kiln being heated to clinkering temperature by a producer gas flame moving in the opposite direction to the feed of material, and cooling the clinkered material in a rotary cooler.

59. Carrer 932,374. August 24, 1909. The improvement in the process of manufacturing portland cement by mixing a quantity of lime with a smaller quantity of zinc compound, burning the mixture and pulverizing the clinker produced.

60. Carson 939,977. November 16, 1909. The process of producing cementitious compositions by igniting a material comprising lime and bauxite, the ratio of such lime to the sesquioxides of the bauxite being greater than 3:1, and subsequently hydrating the

product to a point short of complete hydration to form a dry cementitious mass.

61. Tornyay-Schosberger 954,658. April 12, 1910. Manufacturing cement by adding silicates to the caustic lime used for the clearing of the sugar juices in the manufacture of beet sugar, saturating the mixture of lime, silicates and sugar juices with carbonic acid, removing the liquid from the saturation mud, burning the mud and pulverizing the product obtained, the silicates being added in such a percentage quantity that cement is obtained without further steps.

62. Tornyay-Schosberger 983,521. February 7, 1911. The manufacture of cement by adding silicates to the mixture of sugar-juices and caustic lime obtained in the manufacture of beet sugar, saturating the liquid mixture this produced with carbonic acid, removing the liquid from the saturation mud obtained, burning the mud and finally pulverizing the product obtained to cement without further steps.

63. Hill 1,017,211. February 13, 1912. Making portland cement by mixing predetermined quantities of clay or shale and quicklime and water, the water and quicklime being in such proportions as will effect disintegration of the clay and complete hydration of the lime in the mixture and reduce the mixture during the hydration of the lime to a fine powdery mass; then clinkering such powdery mass, and finally pulverizing the clinker.

64. Rhodin 1,017,913. February 20, 1912. The process of making a white hydraulic cement which consists in mixing together from 150 to 240 parts of feldspar, from 150 to 180 parts of quicklime, from 6 to 8 parts of alum, from 3 to 4 parts of common salt and from 3 to 4 parts of magnesium sulfate, and calcining the mixture at a temperature between 900 and 1100 deg. C.

65. Brown 1,033,984. July 30, 1912. The method of producing hydraulic cement by subjecting calcium sulfate in any of its forms to an oxidizing temperature of not less than 2000 deg. F. till a portion of the calcium sulfate is decomposed, and combining this product with silicious material.

The Edison Patent

66. Thomas A. Edison 1,059,661. April 22, 1913. The invention consists in forming a cement making material by fusing the correct proportions of silicious material, such as quartz, with a sufficiently low percentage of limestone, in the presence of alumina, so as to result in a very fluid slag, such fusion taking place in a suitable water-jacketed furnace, the fluid slag being tapped off at the bottom of the furnace and finely subdivided or disintegrated by means of a jet of air or steam.

67. Duryee 1,082,684. December 30, 1913. The process of making cement by finely grinding hydraulic cement with natural colloidal silica in approximately equal proportions.

68. Warren 1,123,964. January 5, 1915. Producing hydraulic cement by charging a furnace with material containing lime, or lime and magnesia, silica and alumina, the lime, or lime and magnesia content being approximately 50% of the non-volatile constituents of the materials, melting in the furnace under non-reducing conditions, subdividing the silicates from the furnace while still molten into small particles in the presence of a spray of a solution of an alkali forming metal capable of increasing the hydraulic properties of the finished product, promptly removing the solid clinker from the presence of the spray, and grinding the dry clinker with a small percentage of a material adapted to accelerate the set of the cement.

69. Carlson 1,130,143. March 2, 1915. The method of manufacturing hydraulic cement by mixing lime with iron-making blast furnace dust consisting essentially of lime, silica and alumina and collected in a dry gas cleaning apparatus.

70. Carnie 1,158,371. October 26, 1915. Manufacturing cement by burning fuel in a substantially vertical kiln, and introducing pulverized raw cement materials into the kiln at a plane above the materials being held in suspension and calcined by the burning fuel and permitting them to float slowly downward until completely clinkered.

71. Newhouse 1,184,656. May 23, 1916. The process of making cement comprising the coarse grinding of cement forming materials with an excess of water, separating out the fines, adding the over-size to the cement forming materials to be ground with excess of water, removing water from the fines, burning and grinding.

72. Pelton 1,200,645. October 10, 1916. Making colored cement by saturating portland cement with a solution of inorganic coloring matter, burning the colored cement, and then grinding the burned and colored cement to restore the original properties of the cement and bring out the color.

73. Elsner 1,220,735. March 27, 1917. Method for the production of cement from a combustion residue of sewage containing about 53% silica, about 23% total of oxides of iron and aluminum, about 15% of calcium oxide, and about 5% of alkali metal, chlorides, by mixing such residue with at least an equal amount of lime, and with calcium chloride, heating the mixture to a temperature of 600 to 1050 deg. C. for a sufficient time to form a portland cement and treating the mixture with steam and air during the heating.

74. Helbronner 1,239,912. September 11, 1917. A process of manufacturing white portland cement by mixing ferrugineous clay, lime, calcium chloride and coal, agglomerating the mixture into bricks, heating it to 1400 deg. C. to 1500 deg. C. and submitting the mixture during the heating to the action of superheated steam, thereby volatilizing the metallic chlorides and collecting the white cement produced.

75. Pontoppidan 1,242,236. October 9, 1917. Preparing slurry for the production of portland cement by adding sodium carbonate to the material and water, whereby a slurry of given consistency is obtained with a smaller content of water.

76. Carson 1,248,455. December 4, 1917. Improving the plasticity of commercial fine ground calcareous cementitious material by grinding to a very great fineness and mixing with commercial calcareous cementitious material of less fineness, the latter material being of a different analysis than the finely ground material.

77. Hambloch 1,252,264. January 1, 1918. The process of making cement which comprises grinding together raw portland cement clinker and tuff in its raw state.

One of the Eckel Processes

78. Eckel 1,255,995. February 12, 1918. This invention relates to processes of making cement containing combined ferric oxide and silica by the aid of a readily reactive form of silica of the type of infusorial or diatomaceous earth or the like, in which a material containing iron, a lime containing material and a sufficient quantity of such a reactive form of silica are admixed to give the ratio of silica to sesquioxide desired in the finished cement and the mixture burned to form clinker.

79. Dwight and Lloyd 1,283,483. November 5, 1918. Producing hydraulic cement by finely reducing the raw cement materials, finely reducing a solid carbon fuel, mixing the fuel with the cement material, forming a thin stratum of the mixed masses, igniting the fuel component at one surface of the stratum, forcing air through the stratum and causing a relatively thin zone of combustion to gradually traverse the stratum so that the heat generated by the combustion releases the carbon dioxide from the carbonates and causes the silica to unite with the bases and form the silicates of cement.

80. Blumberg Jr. 1,296,467. March 4, 1919. Treating hydraulic cement after it has been clinkered with an ammonium salt whose acid radical is capable of forming an insoluble compound with the magnesium in the cement.

81. Catlet 1,308,932. July 8, 1919. The method of preparing hydraulic cement compositions capable of developing high early strength by incorporating with a hydraulic cement in dry condition dry material comprising an oxysalt of an earth metal.

82. Pontoppidan 1,320,172. October 28, 1919. The improvement in the manufacture of portland cement from raw materials which possess hydraulic properties by forming a slurry of raw materials and water, adding sugar to the slurry to prevent the setting action of such raw materials, and subsequently negativing the preventive action of the sugar by heat and completing the manufacture of the cement.

To Retard Setting

83. Baylor 1,323,952. December 2, 1919. The process of slowing the setting properties of aluminate containing cement by comminuting the untreated cement, mixing calcium oxide with it in a proportion between 6 to 1 and 10 to 1 by weight, and stirring into the mixture the amount of water necessary for the complete hydration of all the free calcium oxide in the mass.

84. Torno 1,342,360. June 1, 1920. Hastening the curing of cementitious masses containing portland cement by mixing therewith dehydrated calcium sulfate, potassium sulfate and liquid in proportions to form a cementitious mass.

85. Matsuo 1,367,984. February 8, 1921. Manufacturing cement by washing sand in hydrochloric acid, adding hot portland cement clinkers to the sand while still in a wet condition, cooling the mixture and pulverizing it.

86. Hoskins 1,370,968. March 8, 1921. The method of producing Keene's cement stock which consists in reducing gypsum to a size such that the largest particles shall not exceed ¼-in. mesh, continuously introducing the product into a rotary kiln, operating the kiln to cause the gypsum to progress through it in a period of not less than ½ hour and firing the kiln to maintain a temperature of not more than 1500 deg. F. and not less than 800 deg. F. in the outgoing burned gypsum.

87. Ferrari 1,372,015. March 22, 1921. A slow setting calcareous cement free from binary calcium compounds of alumina or iron is prepared by converting into slag a raw mixture of the type used for portland cement, in which the proportion between the oxides Fe_2O_3 and Al_2O_3 is comprised between 1 and 1.563.

88. Newberry 1,504,701. August 12, 1924. The process of making cement by grinding together calcareous and argillaceous materials and carbonaceous fuel, mixing the ground material with water, forming the mixture into nodules of small diameter by exposure to moderate heat in a rotating cylinder, subjecting the heated nodules in a thin layer in a vertical kiln to a strong blast of air and grinding the resulting clinker.

89. Newberry 1,504,702. August 12, 1924. The method of producing cement clinker by forming small coherent masses of cement raw materials and carbonaceous fuel, the constituents of which are so proportioned that the argillaceous matter will be less than that required by an amount equal to the ash produced when the combustible constituents are burned, supplying the masses to the upper surface of a laterally enclosed and heat insulated body of similar masses, forcing a strong blast of air up through the body to cause combustion of the combustible constituents and discharging the cement clinker produced at the bottom, agitating the body of material during the passage of air for combustion and disintegrating coherent masses of clinker as they are discharged.

90. Coe 1,547,365. July 28, 1925. Making white hydraulic cement comprising sintering mixture of iron-free laboradorite and iron-free limestone.

91. Eckel 1,555,405. September 29, 1925. The process of making cement containing a titanium constituent, comprising the addition to a normal cement mixture of a suitable proportion of an artificial compound containing titanium.

92. Newhouse 1,589,712. June 22, 1926. Treating slurry by comminuting the solid slurry material in the presence of water to produce heated slurry, and subsequently effecting cooling of the slurry at a sufficiently rapid rate to prevent absorption of enough water to cause setting.

93. Eckel 1,591,662. July 6, 1926. The process of making cement and ferro-silicon comprising the fusion of a cement forming mixture containing iron and silica in the presence of sufficient free carbon to form commercial ferro-silicon and cement slag.

94. Pontoppidan 1,618,295. February 22, 1927. The improvement in the method of making portland cement with an admixture of gypsum by preventing the subjection of the gypsum during admixture to a temperature such as to effect conversion of the gypsum to plaster of paris.

95. Kern 1,623,876. April 5, 1927. A process which comprises burning indurated sand-lime products at about 400 deg. C. to 600 deg. C., the products being made from a natural mixture of calcareous and siliceous material by calcining at a temperature too low to produce any substantial amount of sintering, pulverizing, slaking with enough water to leave a moldable mass, molding, and indurating under pressure at steam heat.

96. Heyl 1,625,853. April 26, 1927. A method of burning cement by blowing in successive planes opposing jets of powdered solid combustible fuel at a vitrifying temperature and blowing a separate jet of a mixture of dry powdered portland cement-forming materials transversely to encounter the flaming jets.

97. Gerlach 1,627,170. May 3, 1927. The process of making cement from materials containing calcium carbonate by heating such materials with zinc retort ashes and carbonaceous material to a temperature above 900 deg. C. and below the clinkering temperature.

98. Kraus 1,629,714. May 24, 1927. The step for imparting plasticity and strength to cement rock by incorporating with finely divided bentonite and liquid, thoroughly mixing the mass, and drying it.

99. Spackman 1,643,136. September 20, 1927. Producing low lime, high aluminous cements by fusing in a rotary kiln a mixture of lime and aluminous materials so proportioned that the lime is present in an amount substantially that required to combine by weight in a monocalcic ratio with the acid acting elements.

Quick Hardening Cement

100. Spackman 1,643,137. September 20, 1927. Making quick hardening low lime cement by heating under oxidizing conditions in a revolving reverberatory furnace raw material having a low content of base and a high content of acid acting elements.

101. Tetens 1,665,993. April 10, 1928. The process for the production of a hydraulic binding material from oil-shale and lime-containing material, which comprises grinding the raw shale together with at least 35% of lime containing material, molding the ground material to lumps and recovering distillation products from the oil-shale, burning the mixture without sintering by the residual shale-coke in the same kiln and grinding the residue obtained by such burning.

102. Hasselbach 1,677,182. July 17, 1928. The method of manufacturing cements rich in aluminum by introducing the raw mixture together with a small percentage of fluorspar into a rotary kiln and carrying through the burning procedure at a temperature below the melting temperature at present employed in making cements without the addition of fluorspar.

Report Extent of New Mexico Rock Asphalt Deposit

A HUGE ROCK ASPHALT BED near Santa Rosa, N. M., promises to be the source of a paving material that may last thousands of years. It is said to be of a quality which offers possibilities the *Jackson* (Mich.) *Citizen-Patriot* reports.

The deposit of natural rock asphalt was discovered several years ago near the eastern New Mexico oil fields. No effort, however, was made to develop this deposit until recently when a local company spent $40,000 investigating it.

The deposit is 12 miles long and 2 miles wide and is estimated to contain 8,000,000,000 tons of the paving material. This estimate surpasses that of Uvalde, Tex., and other deposits of the country.

Test rates have been granted by railroads operating through this region. Machinery for crushing and screening the asphalt has been placed on the ground at a cost of about $70,000. [Other details on this development were published in the August 15 issue of ROCK PRODUCTS.—The Editor.]

Canadian Fertilizer Plant Plans to Export Product

CREATION of a chemical fertilizer industry is expected to add 50,000 tons annually to British Columbia's export total, according to the annual report of the Vancouver Merchants' Exchange. The movement is expected to commence in the near future, it is said, from the plant at Trail, B. C. The export quantity suggested is the expected surplus over the Canadian demand. —*Vancouver* (B. C.) ***Province.***

Sand and Gravel Company Wins Right to Continue Operations

THE ROCK, sand and gravel business in the San Fernando, Calif., valley seems to be rather an important matter these days. Recently certain persons entered a protest with the planning commission of the city of Los Angeles, objecting to the operation of a sand and gravel plant operated by Ernest C. Johnson and Fred Johnson under the name of the Johnson Sand and Gravel Co.

The protestants claimed that there had been a secession of work and an abandonment of the plant for over a year and a half, and the planning commission, after a very thorough investigation and a hearing upon the matter, issued a unanimous report that there had been no abandonment under the zoning ordinance, for the reason that the 60-day abandonment clause was adopted on November 14, 1930, and that since the effectiveness of said ordinance, the planning commission could find no evidence that the plant had ceased work or had been abandoned since that date. As a matter of fact the evidence produced the contrary fact. Therefore this company was granted a "nonconforming permit" entitling it to operate.—*North Hollywood* (Calif.) *Press.*

Fight to Oust Sand Plant Wanes

IN THE ABSENCE of Commissioner Pratt, who has been insistent on annexing a tract on the banks of the Arkansas river at the south edge of Tulsa, Okla., to protect that area against the encroachment of industry, the city commission took no action in connection with a petition for removal of the Midland Sand Co. Commissioner Angel, who recently announced his opposition to all annexation, was also absent.

The commission's only move in the matter was to receive and file a petition from the League of Women Voters asking that steps be taken to preserve the south side residential area.—*Tulsa* (Okla.) *Tribune.*

Killed Trying to Free Rock Crusher

HILLMAN B. BURNS, 35, engineer at the Memphis Stone and Gravel Co. pit, two miles east of Camden, Tenn., was instantly killed October 16 when his body was mangled in a rock crusher.

Mr. Burns was attempting to free the crusher, which had been clogged, when his arm was caught in the machinery and his arm and shoulder were ground off by the machine. His entire body was badly mangled.

He had been employed with the gravel company there for some time and was assigned to the supervision of the rock crusher. —*Huntington* (Tenn.) *Republican.*

Cancel Contract When Gravel Fails to Meet Specifications

MARION COUNTY, Ind., 90-c.-a-yd. gravel contract with William C. Halstead, contractor, will be cancelled.

Dow W. Vorhies, Democratic member of the board of county commissioners, declared that the county will take immediate steps to rescind the contract.

The commissioner made the statement after a test of the gravel by Bruce Short, county surveyor, revealed that the road maintenance material does not meet specifications set out in the contract signed between Messrs. Halstead and Vorhies and George Snider, members of the majority faction of the board of commissioners.

While the contract calls for material containing not less than 70% of gravel, the Halstead product only contains about 35% gravel.

Mr. Halstead's contract with the majority faction of the board of commissioners specified that his gravel was to contain not more than 30% sand when run through a 5-mesh screen. The Halstead gravel, however, according to the test made by the surveyor, would contain about 65% sand and 35% gravel if run through a 5-mesh screen.

"The only thing we can do is to cancel the contract. We can not accept any gravel that does not meet the specifications," Mr. Vorhies asserted.—*Indianapolis* (Ind.) *Star.*

Endorses Change from Structural Steel to Reinforced Concrete

THE CHANGE in the construction plans of the new Port Huron, Mich., hospital building, from structural steel to reinforced concrete, because the latter will give employment to more Port Huron men, is to be commended.

There are few steel workers in Port Huron who are competent to perform the labor on structural steel.

There are, however, many men who can do all the work on concrete contruction.

Reinforced concrete is high grade construction, no less than structural steel.

The change certainly would not have been decided upon, we may be sure, if that was not so.

We want the new hospital building to be the very best building that can be built.

We would not say that the cost would make no difference, but we are certain no one in Port Huron would be willing to have any less quality put into its construction because it was cheaper.

But we are anxious that as many Port Huron men as possible shall be able to work on it during the next few months.

And because it will be possible to put up just as good a building and employ more men at no appreciable change in the cost, the proposed change is to be commended.—*Port Huron* (Mich.) *Times Herald.*

New York Stone Producer Merges with Contracting and Asphalt Companies

ROCKLAND COUNTY, N. Y., was fortunate when the Suffern Stone Co., the Clinton Asphalt Co. and the Highway Distributing Co. combined under one head to serve Rockland.

Joseph Murphy is the president of the three companies and John F. Murphy is the vice-president and treasurer. Joseph A. Martin is the manager.

The Suffern Stone Co. operates a large trap rock quarry in Suffern and furnishes all grades of crushed trap rock for road building. The Clinton Asphalt Co.'s offices are in the same building as the Suffern Stone Co. and it furnishes asphalt, concrete and other road surfaces. The Highway Distributing Co.'s plant is located in West Nyack. It furnishes asphalt and road oils. The Clinton Asphalt Co. also has an office in Union City, N. J.

Mr. Martin, the manager, is a well known man in the business, as he has been associated for many years with the Belmont Gurnee Trap Rock Co. and the George M. Brewster and Sons Co. before becoming manager of the Suffern Stone Co.—*Nyack* (N. Y.) *Journal.*

Install Natural Gas Burners in Gypsum Plants

H. D. SCHRADER of Oklahoma, a ceramic engineer with the Webster Engineering Co. which makes burners of all kind for industrial use, is in Ft. Dodge, Ia., supervising the installation of natural gas burners in the gypsum and clay plants of the surrounding territory.

Gas as fuel has been in use for some time at the gypsum plants.—*Ft. Dodge* (Ia.) *Messenger.*

Appoint Thomas J. Harte Vice-President and General Sales Manager

FREDERICH W. KELLEY, president, North American Cement Corp., Albany, N. Y., announces the election of Thomas J. Harte as vice-president and general sales manager, succeeding Frederick A. Boeye, whose death occurred October 3.

Mr. Harte has been associated with Mr. Boeye from the beginning in training and handling the company's sales organization.

Thomas A. Giberson

FUNERAL SERVICES for Thomas A. Gilberson, 63, vice-president of the Cleveland Quarries Co., were held November 1 at Lakewood, Ohio. Mr. Gilberson died October 29 of heart disease. He had been with the quarries company 40 years.

He was buried in Berea, where he was born.—*Cleveland* (Ohio) *Plain Dealer.*

Lime Production Methods of Europe and America

Part VII—Factors Governing Selection of Lime Kiln Refractories

By Victor J. Azbe
Consulting Engineer, St. Louis, Mo.

Editors' Note

In this article the author discusses the characteristics of the various refractories and their relative values when used as linings in lime kilns.

While resistance to chemical attack by the lime and impurities is of the greatest importance, the density and expansion of the brick also materially affect the life of the linings.

The softening point is stated to be even more important than the fusing point because of the wear by the lime sliding past.

The importance of using a proper bonding material in laying up the brick is also stressed.

—The Editors.

SO MUCH DEPENDS upon the lime kiln refractory that it is almost impossible to discuss capacity and efficiency of kilns without first taking into consideration refractory limitations. So the order will apparently be again upset and instead of continuing discussion of American and European kilns the interactions of lime and silica and alumina that take place in the kiln will be studied. This study, however, is not only important from a refractory angle but much of it can, as well, be applied to the formation of lime silicates and aluminates, when lime is overburned, or, when cement slags or hydraulic limes are formed.

The selection of refractories for lime kiln linings is always somewhat of a problem, but it is getting to be more so than ever. The realization is dawning that high temperatures mean higher fuel efficiencies, that is, more lime for a given amount of coal, also that with the use of induced or forced draft undreamed of kiln capacities can be attained, but all this means more severe physical and chemical wear of the refractory kiln lining. The present limit of kiln capacity is only the refractory life; in a certain plant kilns producing 60 tons of lime per kiln per day could readily be operated to produce 80 or possibly 100, if dependency could be placed on the lining. But kilns operating at low capacities often also give out in a very short time. Periods of two months between repairs are not uncommon and much shorter periods are known. In contrast one could mention others that were on the line for years, two and three and even more years. At times, peculiarly, kilns operating at low capacities fail sooner when forced up to very high extremes than those which were operated at medium high capacities.

Fig. 95—A kiln with badly destroyed lining

Fig. 95 shows what one often finds when a kiln comes off the line; destroyed arches, eaten in walls, accumulations of slag that interfered with proper flow of lime, sagged walls with open joints, etc. Figs. 96 and 97 show another kiln where the severe action over the eyes destroyed the outer arch ring, also much of the 9-in. lining and as the outer course was not tied into the back wall much of it fell out, necessitating more extensive repairs than should have been the case. In both Figs. 96 and 97 it can be plainly seen how the severity of the action tapers off. Above the eye all of the 9-in. course was eaten away, while a few feet up only a few inches was affected. If the lower portions would have been made of some superior material and probably of 13½-in. instead of 9-in., then the entire lining should have lasted a considerably longer period.

For all of this, there are many reasons, physical and chemical, in the nature of things and in the nature of man and existing conditions. There may be abrasion, spalling or slagging; poor refractory or good refractory poorly applied; generally or only locally severe conditions of temperature, load or wear; infrequent or improper drawing of lime; impurities of the lime or brought with the lime into the kiln as clay rich in fluxes; too high flame temperature, local or general; porous brick penetrable by slags; shrinkage of lining or of bonding material in joints admitting lime dust and slags into cracks; distortion due to load and rubbing of soft surfaces; improper construction of kiln, making control of drawing and of temperature conditions impossible.

Now there are a great many refractories such as ordinary fire clay, bauxite, diaspore, silica, zirconia, spinel, chrome, dolomite, magnesite, silicon carbide, etc., but as with most other things those that are very good are also very expensive; so one is forced to compromise, which compromise should be carried so far as to select particular brands for particular portions of the kiln. As an example, the storage zone of the kiln could, to advantage, be lined with hard brick which would not do at all in the hot zone and even portions of the hot zone need something different from other portions. Arches of the firing eyes require something particularly good.

The brick ordinarily used is made of high grade fire clay of which the most desirable

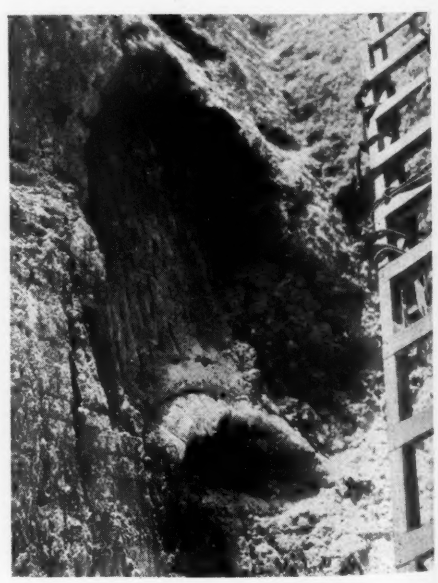


Fig. 96—Another kiln with inner lining entirely gone

component is alumina (Al_2O_3) and next silica (SiO_2), these two being present in the original clay either in a free form or combined as kaoliniite, the pure clay substance of a composition $Al_2O_3 \cdot 2SiO_2 \cdot 2H_2O$ with proportions by weight of alumina 39.45%, silica 46.64, water 13.91%. In addition, however, feldspar also is present in variable amounts, it being a silicate of alumina combined with some potash (K_2O), soda (Na_2O), lime (CaO), magnesia (MgO) and iron (Fe_2O_3); all of these latter being undesirable substances acting as fluxes, thus lowering the ability of the main ingredients to withstand the heat. It should be noted that lime and magnesia are considered as harmful impurities.

Repeating, alumina and silica are desirable elements, but different combinations of these two will have different softening points. For general lining what is wanted is "kaolinite" or "clay substance," $Al_2O_3 \cdot 2SiO_2 \cdot 2H_2O$, with as much free alumina as possible, reasonably low in free quartz and particularly low in feldspar. The ultimate analysis of a clay does not reveal the true combination, and a rational analysis also is needed which splits the mass into main groups rather than final components. Following is the ultimate analysis of two clays:

ULTIMATE ANALYSIS

	No. 1	No. 2
SiO_2	62.40	62.52
Al_2O_3	26.51	25.57
Fe_2O_3	1.14	0.92
CaO	0.57	0.65
MgO	0.01	0.10
Alkalis, Na_2O, K_2O	0.98	1.04
Loss on ignition	8.80	9.27

These two clays appear very much alike; however, rational analysis reveals the following:

RATIONAL ANALYSIS

	No. 1	No. 2
Clay—substance	66.33	72.05
Quartz (SiO_2)	15.61	27.78
Feldspar	18.91	0.10

What appeared to be alike is here quite different and Clay No. 2 is much better than

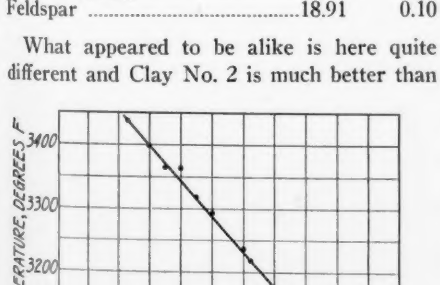


Fig. 98—Fusibility of bricks containing varying proportions of silica and alumina

No. 1, the latter being an insufficient weathered clay closer to its ancestry, a granite rock. Much more, however, enters into the selection and the physical nature of the clay is almost more important than the chemical.

It may be mentioned here that the lime burned in the kiln and the lining of the kiln may have had the same origin, the ancestor being a feldsphatic rock, as granite, which was broken up in weathering, the lime being leached out and carried by streams to the sea to be deposited as a limestone bed, while the free quartz, alumina, kaolin and feldspar were also washed and deposited in some clay bank.

Pure alumina has a fusing point of 3722

Fig. 97—Part of the inner lining has fallen out

deg. F, pure silica 3110 deg. F. Combined in any way, even when there are no impurities present, the fusing point will be less and may be as low as 2813 deg. F. Even a slight amount of impurities will lower this point still more. Fig. 98 shows graphically the fusibilities of several bricks containing various proportions of silica and alumina.

Now, while lime kiln temperatures as high as 3000 deg. F. have been measured, that is unusual as even 2800 deg. F. is unusual and they seldom exceed 2600 deg. F. These temperatures are not so high as to seriously harm even poor grade fire brick and certainly should not harm good grade fire brick. It was mentioned, however, that the admixture of a second substance drops the fusing point, and the entrance of a third substance, lime, into the brick structure will drop the fusing point still further and may drop it as low as 2138 deg. F. when the proportions are 23.3% CaO, 14.7% Al_2O_3 and 62.2% SiO_2.

Then, in addition to the fusing point referred to above, there is a softening point much lower than the fusing point. All fire clay bricks are not just one substance but a physical mixture of two or more. Some of these become fused at lower temperatures, others remain solid and so the whole is semi-solid and subject to abrasion by the sliding lime. There may be also deformation by the load the lining carries or the shock it is subjected to during the fall after drawing and punching. The softening point is determined by the load; the heavier the load, the faster the flow. The time element also enters into the picture, and while a sample tested in the laboratory for a certain period under a certain pressure may show no flow, tested for a longer period may show it. In a lime kiln brick is subjected to load and to temperature for months and so the effect naturally must be greater than any that can be reproduced in the laboratory. In Fig. 99 some curves determined by Hewitt-Wilson are given showing the deformation of various refractories under a load of 25-lb. per sq. in. at different temperatures.

It will be noted that some refractories hold their shape under very high temperatures, others give way at comparatively low temperatures. Some give way fast and some give way slowly, ordinary fire brick appearing to be about the worst, as it softens at a low temperature and gives way fast; other fire brick may soften at the same temperature but give way slowly, which is much more desirable. Silica has a very high softening point and when it is reached the brick collapses almost suddenly. The high alumina refractories have a much higher softening point and this, in part, justifies the much more expensive high alumina brick. Some refractories have no softening point within ordinary temperature ranges encountered in vertical and horizontal lime and cement kilns.

It thus becomes apparent that a great many items enter into the selection of a refractory for a lime kiln. The importance of chemical composition has been already pointed out. We have high silica to high alumina fire clays with variable contents of impurities and harmful fluxes. Then there are other refractory substances, some with very high fusing points and others with other valuable characteristics which are conferred to them by the nature of their chemical compositions. The chemical composition of the refractory, to a great extent, deter-

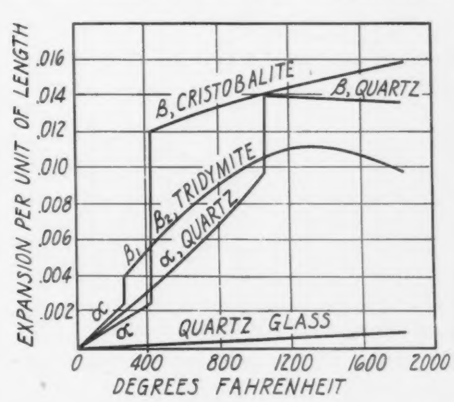


Fig. 100—Expansion of various kinds of silica under heat

mines how the refractory will react with the lime or with cement or coal ash. Some refractories are basic or neutral in character, others acid. Lime is a base and under ordinary conditions basic and acid substances combine to form something different from either, ordinarily inferior in charateristics.

The *fusing point* is of considerable importance when selecting a refractory. Ordinarily, the higher it is, the better, but not always so. Under certain conditions a refractory of low fusing point may be better than one of high fusing point provided it has

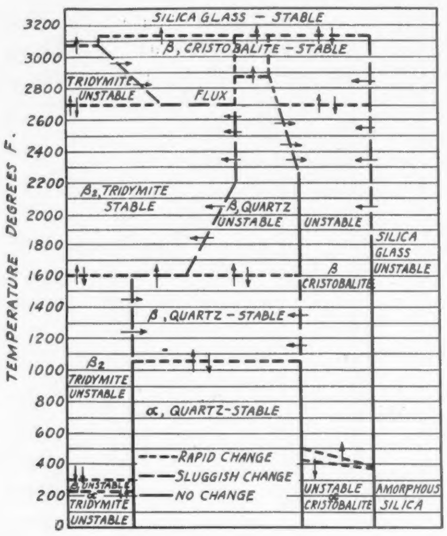


Fig. 101—Crystalline changes in the silica system

other advantages that more than offset the disadvantage of a lower melting point. Silica brick has a lower fusing point than a good grade clay brick, but under proper conditions it will last better because it has a higher softening point.

The *softening point* is one of the important characteristics to take into consideration. What good is a melting point of 3000 deg. F. when the brick becomes soft at 2300 deg. F. and possibly flows or at least is gradually worn away by the lime rubbing over the soft surface? Here, however, one must also distinguish between long range and short range softening zone. The desirable condition is a high fusing point and a high softening point with the refractory in the softening range losing its viscosity very slowly. Load, as has been shown, has much to do with the flow in the softening range, the initial deformation beginning much sooner when the refractory is under pressure. The principle back of this is, of course, that anything soft will be squeezed out of shape more by a greater than by a lesser weight. The softening point of a clay brick can readily be 900 deg. below the fusion point and as this is below the temperatures at which lime is burned, the seriousness of the matter is realized as well as the importance of having the lining carry as little weight as possible.

The softening before the fusing is usually due to the presence of liquids among the solid particles. A clay brick, for example, may consist of free alumina and free silica and of alumina and silica combined. Both alumina and silica particles remain solid to very high temperatures but the compound of the two has a comparatively low fusing point and so gives way and the whole mass becomes plastic.

A further very important factor is *porosity*. Lime men seem to realize the importance of having the joints between the brick as thin as possible so the least surface will be exposed to lime action. However, the brick is porous and into these pores the slags formed on the surface penetrate and attack the still unaffected portion of the brick, all about the same as the penetration into the open joint. As the brick ordinarily has some 30% of pore space, its surface is quite open and spongy, and the chemical attack takes place over several times greater surface than merely the outer surface. It is quite possible to reduce the pore space. If reduced much, however, it will incline the brick to spall, especially if there is much free quartz present, as this expands considerably and with insufficient space available to freely expand into would push the whole brick apart. There are now available special refractories which are cast in molds from alumina fused in an electric furnace. These shapes have a very low porosity, only about 1%, and while their fusing point is no higher than of good grade alumina brick, a much longer life can be expected of them because in a kiln the chemical action would take place only on the surface. The objections are that due to high density there is danger of spalling and in the effort to overcome this the shapes after being made are cooled very slowly or annealed as a glass bottle is annealed after being blown. Another objection is cost—anything of this nature—fused electrically—is bound to be expensive. High cost, however, should not preclude the use of a high grade refractory. No one, of course, would dream of recommending that the entire kiln be lined with something costing probably a dollar a brick. However, as a kiln has many zones of different severity it appears that one should use many kinds of refractories. It is not exactly right to use the same kind of brick in the high temperature, high chemical activity zone as further along where comparatively mild conditions exist. To be consistent one should use the best at the most severe points and then taper off. For arches of vertical kiln, as an example, there is hardly anything that one could call too expensive.

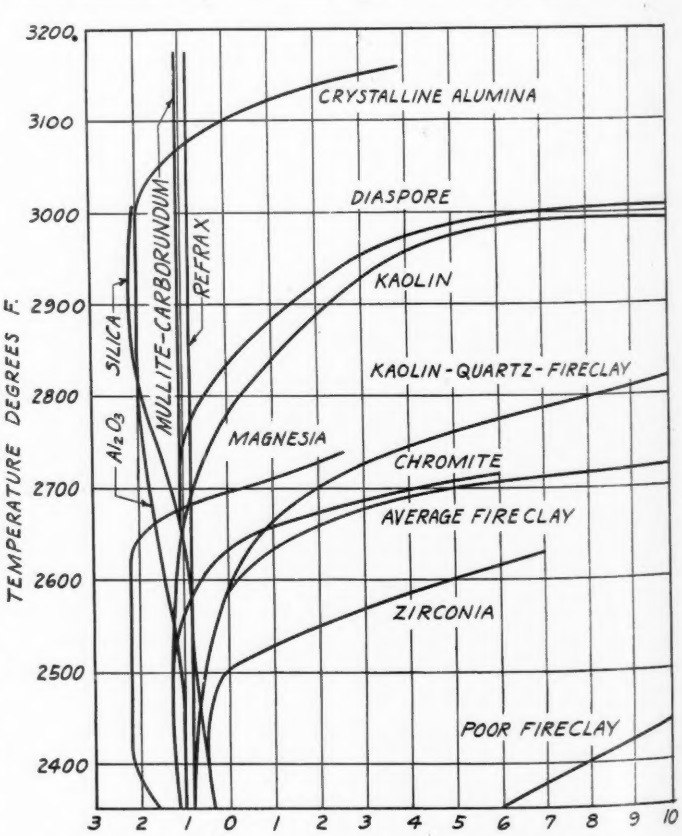


Fig. 99—Deformation of refractories under load at different temperatures

Dr. H. Hirsch made a study of lime kiln linings for the German Lime Manufacturers Association; with the many other items he studied also lime attack upon fire brick. He selected five different clay brick all of 38-39% alumina, two of which were porous and three of denser characteristics as shown below, and found that the porous sorts were attacked far more than the dense.

RELATIVE LIME ATTACK ON POROUS AND DENSE REFRACTORY

	Porous specimens A	B	Dense specimens C	D	E
At 2570 deg. F.	4.	2.0	2.	2.	0.2
At 2678 deg. F.	14.	5.5	3.	3.	2.5

Between the higher and lower temperatures the difference was also quite considerable and apparently the attack increased in severity much more with porous refractories than the dense.

Dr. Hirsch next took fire brick specimens, covered their surfaces and subjected them to similar tests for lime attack. Naturally, the protected specimens, as long as protected, suffered much less.

EFFECT OF SURFACE PROTECTION ON LIME ATTACK

Alumina content of refractory	Burning Temp., deg. F.	Unprotected	Zircon protected	Corundum protected
26.8	2570	3.	0.2	0.0
	2678	10.	2.5	0.3
36.9	2570	7.	0.2	0.0
	2678	20.	3.0	0.4

Thermal expansion is a very important factor to consider. All refractories expand on heating. The ideal is, however, to have

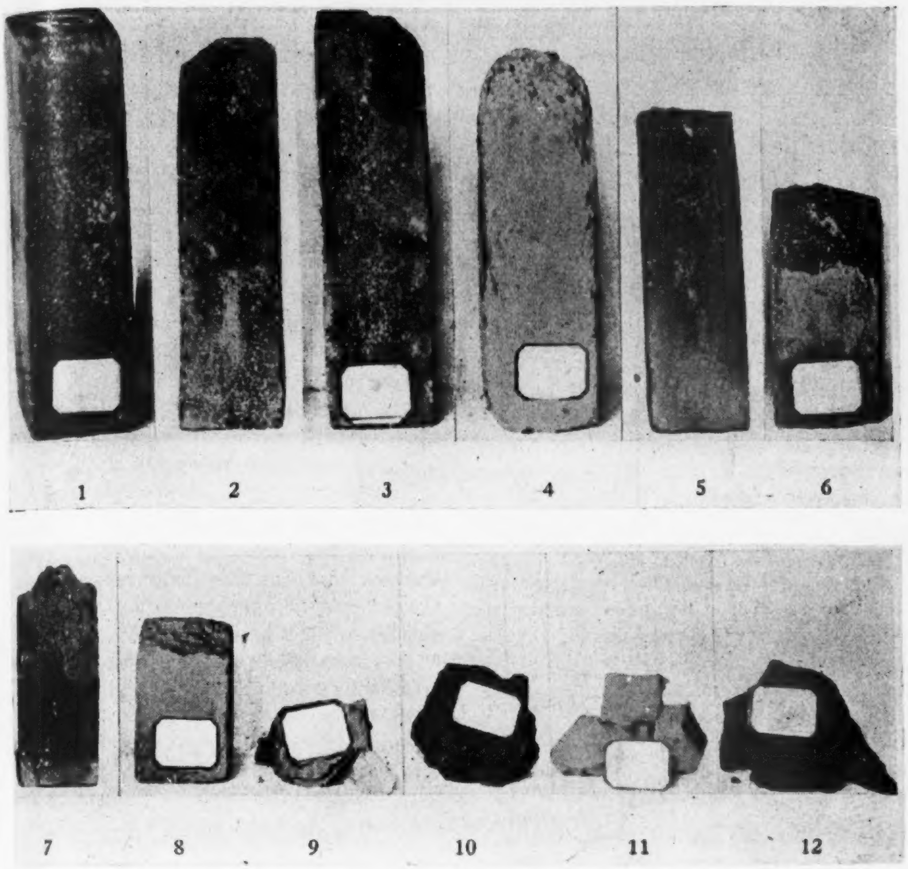


Fig. 102—Comparative average spalling loss of various refractories: (1) carbofrax C; (2) carbofrax A; (3) carbofrax B; (4) grade A fireclay; 5 recrystallized carborundum; (6) bauxite; (7) zirconia (natural); 8 grade B fireclay; (9) grade C fireclay; (10) chrome; (11) silica; 12 magnesia

as slight expansion as possible and as steady expansion as possible, with never any shrinkage. Silica brick is a bad actor, as on heating at certain temperatures it changes suddenly from one form into another of lower density and it has to expand. If space is provided for this expansion when laying brick and the heating is very gradual, and if later temperature fluctuations are slight, all is well; but if not, something will have to let go and most likely the brick will spall. The reason for this is shown in Fig. 100, from which it can be deduced that there are several kinds of silica; as *alpha* and *beta* quartz, *alpha* and *beta* cristobalite, *alpha* and *beta* one and *beta* two and *tridymite* and fused quartz glass. Cristobalite shows very marked expansion when it changes its form from *alpha* to *beta* at 428 deg. F. Quartz exhibits less expansion at 1067 deg. F., while tridymite is more constant with only one sudden break, which, however, is comparatively mild. Fig. 101, after J. Spotts McDowell, shows further the highly interesting intricate crystalline changes in the silica system. Therefore, in laying silica brick, generous spaces are provided in the walls into which the brick can expand, or at times strips of wood of definite thickness are laid into the joints, which, when high temperatures are reached, burn out, and so provide necessary voids into which the brick can expand. All refractories should have some expanding characteristics, but some clay brick at times is inclined to shrink, especially if not burned right, which not only causes arches to sag but also opens up the joints into which lime dust settles and plays general havoc. The clay in the joints shrinks, and if joints are too thick great spaces are opened up, weakening the whole structure.

Desirable Characteristics

From what has been said heretofore, a refractory for use in a lime kiln should be resistant in four different ways: Resistant to thermal attack; resistant to chemical attack; resistant to wear; and resistant to spalling.

Resistance to thermal attack only is a simple matter. All refractories, even poor grade fire brick, have fusing points higher than ordinary lime kiln operating temperatures. If the chemical nature of the refractory would remain the same and not be impaired by lime, then it would never slag and never run. It would only wear out, as, due to load, it would be in a somewhat softened state even when uncontaminated. Fusing points of different refractories are given in Table II.

In view of the above, resistance to chemical attack becomes of the greatest importance, as the idea is to keep a refractory a refractory as long as possible. If it combines in any way with anything it becomes an altogether different substance. In truth, one could say that kilns, at least, after being on the line for a while, are lined with a form of glass which has a low resistance to thermal attack, is inclined to run when temperatures become the least bit higher, is inclined to destroy the good qualities of adjacent brick, and is of a soft nature, easily displaced by the lime sliding past.

Resistance to chemical attack is obtained in three ways: First, selection of a refractory not inclined to readily combine with lime, as, for example, a high alumina brick; second, selection of a refractory comparatively pure in nature that will have a high softening point and so not be readily attacked, as silica brick; and third, selection of a refractory of dense nature so that if attack takes place it will be on a limited front, that is, only on the surface, with little penetration into its body.

Resistance to wear is obtained by the selection of a refractory that will tend to hold its body at high temperatures and will not become semi-fluid. Silica brick could be so classified, or fused alumina, as well as others of a special nature, such as silicon carbide, provided other conditions are favorable to these special refractories.

Resistance to spalling is both a matter of proper selection and proper application. Properly burned refractory must be selected and then properly applied. Overly large shapes are not burned uniformly and, not being able to adapt themselves to great and possible sudden changes in temperature, tend to spall. Silica shapes not having received a hard burn or not having been laid properly, or when exposed to unreasonable temperature fluctuations, are particularly inclined to misbehave. There are many other

TABLE II DATA ON VARIOUS REFRACTORY MATERIALS

Composition	Fusing temp. Deg. F.	Temp. of failure under load, deg. F.	Reactive state	Remarks
Alumina, Al_2O_3			Neutral	
Alundum			Neutral	Clay-bonded aluminum oxide, burned
Bauxite brick	2850–3245	Softens at 2462		Danger of shrinkage
Carborundum, SiC	3992–4064	No failure at 3002	Neutral	Oxidizes above 2300 deg. F. Affected by slags, also particularly by iron and alkalies
Chromium oxide, Cr_2O_3	3614			
Chrome brick	3362–3722	Shears at 2552–2642	Neutral	Too high thermal expansion, weak mechanically at high temperature
Fire clay brick	2732–3182	Softens at 2282–2732	Acid	Low softening point
Magnesium oxide, MgO	5072		Basic	
Magnesia, sintered	3992–4712		Basic	Weak mechanically
Magnesia brick	3902–3929		Basic	
Silica, SiO_2	3065–3272	Shears at 2912–3002	Acid	Inclined to spall
Mullite, $3Al_2O_3 \cdot 2SiO_2$	3300			
Spinel, $MgOAl_2O_3$	3875			
Zirconia, Z_2O_3	4532–5342			
Zirconia brick	3632–4712	Softens at 2750		

excellent refractories unsuitable for lime kilns because they are weak mechanically. Fig. 102 gives interesting photographs of results of the work of Hartmann and Hougen, showing comparative tendencies of various refractories to spall when tested in exactly the same manner.

In Table II a long line of refractories is given, with some of their properties. Some are used in kilns, some probably could be used to good advantage but where not systematically tried or probably tried under improper conditions; others, again, are entirely unsuitable, due to either improper chemical or physical characteristics.

One would think dead-burned magnesia, being so closely related to lime, and basic as well, would be the ideal lime kiln refractory, and it woud be if it were not mechanically weak. Spinel, a compound of magnesia and alumina, highly refractory, may also be the solution. It was tried out but, for some reason unknown to the writer, abandoned. Silican carbide would be just great, but first it is costly, second it is attacked by slags, and third it does not last very well in an oxidizing atmosphere. Silica is good if properly laid, but even then if the kiln cools beware of it. Ordinary brick softens and slags too readiy. In spite of the long list, every single item has its objectionable feature, which makes the problem of selection complex and necessitates a thorough knowledge not only of the refractory but in addition, of the kiln and its operating conditions.

(To be continued)

United States Gypsum Co. Adds to Mill at Alabaster, Mich.

A 40-TON TUBE MILL is being installed at the United States Gypsum Co. plants at Alabaster, Mich., pending the outcome of tests that have been conducted for the past two years on the practicability of producing white plaster products, from the gypsum rock quarried in that vicinity.

It is expected the manufacture of these additional products will be of great importance to the plant, according to J. H. East, superintendent. He said all preliminary tests of the rock had fulfilled the necessary standards of purity.—*Bay City* (Mich.) *Times.*

Announce Date of Highway Research Board Meeting

THE eleventh annual meeting of the Highway Research Board, National Research Council, will be held on December 10 and 11, 1931, in Washington, D. C. The meetings will be in the auditorium of the National Academy of Sciences.

The sessions will be devoted to discussions of reports of research activities in relation to highway finance, transportation, design, materials and construction, maintenance and traffic.

To Develop Standard Specifications for Sieves

THE STANDARDS COUNCIL of the American Standards Association has approved the initiation of a project to develop standard specifications for sieves for testing purposes (Z23). The American Society for Testing Materials and the U. S. Bureau of Standards have been appointed joint sponsors for the new project.

The organization of a sectional committee, which will include American technologists interested in sieves for testing purposes, is now under way. Specifications for sieves developed by the American Society for Testing Materials in cooperation with the U. S. Bureau of Standards, in 1926, will be used as a basis for the work of the committee.

It is expected that this committee will cooperate with the technical committee on sieves for testing purposes of the International Standards Association, looking to the development of an international standard for testing sieves. The ISA committee has been working for some time, the national standardizing body of Poland being the secretariat.

Fire Destroys Fort Scott Hydraulic Cement Plant—To Rebuild at Once

FIRE BROKE OUT in the Fort Scott Hydraulic Cement Co. plant in what was called the North Mill at Fort Scott, Kan., October 21, and completely destroyed the main buildings.

Howard Thomas, owner of the plant, said that the plant will be rebuilt as rapidly as possible.

In the meantime the plant will be able to take care of the usual run of orders from warehouses for some time.

The fire started from unknown origin in the southwest part of the building, but the location was right for the wind to drive over and through the building rapidly.

The fire company responded to the alarm, but the fire was out of reach of the fire apparatus.

The company office, kilns, trucks, etc., were undamaged.—*Fort Scott* (Kan.) *Herald.*

Trade Mark Registration Denied

ON OCTOBER 19 the United States Supreme Court denied a writ of certiorari to review trade-mark opposition proceedings between the United States Gypsum Co. and the Plastoid Products, Inc., involving registration of the trademark "Rocklath." Proceedings are still pending in the patent office to determine whether Plastoid Products, Inc., will be able to register "Locklath" over the opposition of the United States Gypsum Co.

Governor Proposes State-Owned Cement Plant in Mississippi

LEGISLATION to establish a $1,000,000 cement plant in Mississippi was recommended for enactment October 20 by Governor Bilbo in a lengthy special message.

"It will save taxpayers between $6,000,000 and $7,000,000 annually in road building," he said.

The plan of Governor Bilbo is to take $100,000 a year from the gasoline tax as a building fund for the plant, total cost of which will run around $1,000,000.

The principal object of the plant, he says, is to furnish the cement for paving the 6000 miles of highways authorized to be hard-surfaced by the Stansel law that passed last session.

Satisfactory financing measures for the hard-surfaced program have not yet been worked out in the legislature, Governor Bilbo wanting a large bond issue, and house leaders wanting a "pay as you go," financed by a higher gasoline tax and increased privilege taxes on automobiles.—*Memphis* (Tenn.) *Evening Appeal.*

[A bill has been introduced to appropriate funds for the construction of a state-operated plant.—The Editor.]

Lightweight Building Materials Described in Series of Reports

AMONG RECENT TRENDS in building construction is the rapid introduction of lightweight materials, the efficient use of which permits appreciable savings in total building costs. A series of reports describing their manufacture, properties, and uses is now being prepared by H. Herbert Hughes, building materials section, United States Bureau of Mines.

The first of these papers is a general summary of the entire field. The rapidly growing importance of home insulation is stressed; the advantages of soundproofing, acoustical treatment, and fireproofing in all types of construction are pointed out; and several examples of unusual architectural treatment of buildings are mentioned. Various lightweight building materials now on the market are discussed briefly.

Succeeding reports will be devoted to a detailed description of an individual material or group of materials. The tentative outline for the series includes burned shale aggregates, cinder concrete, slag concrete, sawdust concrete, aerated concrete, natural volcanic rocks, gypsum products, ceramic products, and mineral wool.

The bureau will welcome suggestions relating to any phase of the study. Communications regarding these reports should be addressed to the United States Bureau of Mines, Washington, D. C.

Gravel Company Asks Court Help to Save Contractor Customer

THE Boston Sand and Gravel Co., Boston, Mass., in a bill in equity filed in the Suffolk Superior Court states that the closing of a bank has seriously embarrassed the Frankini Brothers Co., Inc., of Medford, and asks the court to appoint a receiver so that interference with contracts now being performed by the Frankini company may be prevented.

The sand and gravel company states that the Frankini company is solvent and will be able to pay all bills if permitted to continue to use its equipment and assets and without interruption of its contracts by suits and attachments.

The Frankini company is now performing a large contract for the commonwealth, it is stated, in connection with the state prison at Norfolk, a contract with the United States for the addition to the naval hospital in Chelsea, a contract with the town of Brookline for the erection of a municipal field house, and several other large contracts for municipalities and corporations.

Any interruption in the work, it is stated, will cause large penalties to be imposed upon the Frankini company.—*Boston* (Mass.) *Post.*

Building New Gypsum Plant

THE BEST BROS. KEENE CEMENT CO. is building a new plant at Sun City, Kan., on the new Santa Fe switch now being built there.

Heretofore the rock from the quarry at Sun City was transported by an aerial tramway from the quarries. The new railway switch will make it possible to handle much larger volume.

Rapid progress is being made on the new railroad switch and plant at Sun City.

Such portions of the present plant as can be utilized on the new project are being dismantled and moved over to the new scene of operations at the head of the railroad switch.

A new crusher, much larger than any previously used by the company and having a capacity of 200 tons per hour, has been purchased. The foundation pit for it has been completed.—*Hutchinson* (Kan.) *Herald.*

Fire Destroys Gravel Plant in Mississippi

THE LARGEST of two of the washed gravel plants of the Brookhaven Gravel Co., seven miles east of Brookhaven, Miss., was destroyed directly by fire.

No curtailment in output of the gravel company has resulted, as the second unit is being used.

Insurance is understood to have covered the loss incurred by the fire to the plant. T. W. Maddux is manager.—*Brookhaven* (Miss.) *Leader.*

Recent Prices Bid and Contracts Awarded

Circleville, Ohio—Sturm and Dillard Gravel Co. was awarded a contract to furnish 1600 tons of washed and graded gravel to spread and deliver on a section of road south of Derby. The bid was $1.50 per ton, which includes material, 70c., and trucking, 80c.

Jefferson, Ohio—Contract for 8650 tons of slag to be placed at various points in the county for maintenance work was let to the Troyer Construction Co. by the board of commissioners at approximately $2 per ton.

Winona, Minn.—A contract has been awarded for graveling on trunk highway 46 near Lindstrom. The project requires 9900 cu. yd. of gravel. The low bid was at 49c. per cu. yd. by the Hector Construction Co.

Muncie, Ind.—Four bids for gravel in road district No. 7, filed with the Delaware county, Ind., commissioners showed a price range with a difference of 26c. per cu. yd. between the low and high bids. No contract was let and the commissioners will inspect the gravel.

Bids received included one by O. W. Lykins at 40c. per yd., the gravel to be screened over a 2-in. screen on the Boxel farm. J. Watt and John W. McCreery bid 39c. per yd. with no screen provisions for gravel from the Skinner farm; W. M. Torrence made a bid of 45c. per yd. for gravel from the Hiatt farm with screening provisions, and Mildred Marie Russey bid 65c. per yd. for gravel already lifted over a 2-in. screen, or 47c. per yd. pit run.

Report Improved Business for Tennessee Sand and Gravel Companies

BUSINESS CONDITIONS in Benton county, Tennessee, are gradually improving, according to business men and contractors.

The Camden Gravel Co., of which Charles P. McAllister is manager, has recently received an order for 100,000 tons of gravel to be delivered within 90 days. An additional standing order of 15 cars of gravel daily has also been received. These two contracts will provide work for more than 50 men until February. The Memphis Stone and Gravel Co. has also received enough orders to allow them to run regularly.—*Nashville* (Tenn.) *Tennessean.*

Issues House Organ

"THE TRAYLORIAN" is the name of a house organ now being issued by the Traylor Engineering and Manufacturing Co., Allentown, Penn. The first issue, November-December, is dedicated to the founder of the company, Samuel W. Traylor, Sr., chairman of the board. Its eight pages contain "some news, some views and some foolishness."

Steel Companies Plan to Truck Stone from Quarries

LEADING iron and steel companies in the Youngstown, Ohio, district are surveying plans to transport flux stone from the quarries to the blast furnaces by motor truck instead of using the railroads. A detailed survey is now being made to ascertain costs by purchasing equipment and handling the transportation under a group plan, or by letting the work out under contract.

This action by the steel producers follows the Interstate Commerce decision granting the railroads a flat increase of $3 per ton on certain raw materials entering into iron and steel production, including flux stone, limestone and other commodities.

Unwilling to pay this additional premium, leading independents are arranging to resort to the plan referred to. Bulk of the flux stone consumed by blast furnaces in this district may be secured within a comparatively short distance from Youngstown, either at Carbon, Penn., or Bessemer, Penn., and trucking the material presents no unusual difficulties.

It is understood the Youngstown Sheet and Tube Co. and the Republic Steel Corp. plan to pool their interests in this respect in an effort to reduce transportation charges.—*Cleveland* (Ohio) *Plain Dealer.*

Opens New Quarry in Ohio

A NEW STONE QUARRY is being opened at Sharpsville, Ohio, and will be operated by Orville Reed of Martinsville. Work of crushing will get under way immediately.

Mr. Reed will furnish stone for township road work in that community. He also will furnish stone for Clinton county. For several years he operated the Farmers Station plant. Mr. Reed made the change to get into a better grade of stone and located in a territory where he could supply the demand with a shorter haul.

Mr. Reed has equipment capable of turning out more than 100 tons per day.—*Lynchburg* (Ohio) *News.*

Potash in New Mexico Relieves United States of Foreign Dominance

THE END of American dependence on foreign sources for potash is seen by government officials with the announcement that specimens of the first potash minerals ever mined in the United States have been placed on exhibition in Philadelphia.

The minerals are from Eddy county, N. M. The geological survey said that "there appears to be sufficient potash available here to supply the American demands, even with a greatly increased consumption, for many decades."—*Chicago* (Ill.) *Tribune.*

Mining, Treatment Methods and Costs at the East Texas Gravel Co.'s Deposits Near Bois D'Arc, Texas*

By Walter W. Hyde
Consulting Engineer, U. S. Bureau of Mines

THE gravel deposits are located in the southwestern part of Kaufman county, about 20 miles southeasterly from Dallas and approximately 5 miles south of the main line of the Texas and New Orleans railroad (Southern Pacific Lines) at Bois D'Arc. From this point a standard-gage railroad track has been constructed connecting the main line with the loading tracks at the deposits.

In early operations a small dragline machine was used to remove the overburden and to excavate and load the sand and gravel on standard-gage railroad cars. The material was used for railroad ballast, but the demand for other uses grew so rapidly it was soon necessary to increase production, and the present plant is the result of a gradual development brought about by the necessity of producing various special grades of sand and gravel.

Editors' Note

THIS paper is one of a series being prepared by the U. S. Bureau of Mines describing the methods used in the mining and preparation of sand and gravel. These papers are designed to disseminate detailed technical information regarding the methods used, as well as costs on such a basis that they are comparable to those of other producers. The cost tabulations represent direct operating expenditures only and not total production costs.

In this paper the method of removing surplus sand and small pebbles at the pit is particularly interesting.—The Editors.

Description of Deposits

The sand and gravel deposits, which lie in the immediate vicinity of Dallas and in close proximity to the Trinity river and its tributaries, are quite similar in character and as a general rule are all more or less subjected to overflow of flood waters.

The deposits were derived from the disintegrated and broken fragments of the hard limestone and sandy formations of the Commanche and Carboniferous rock to the west. Their origin is proved conclusively by the character of the constituents and by the fossils found in the deposits.

Unquestionably these materials were worked downstream, largely by flood waters, to form these gravel deposits, and the materials while in transit were not only rounded by abrasion but were also to a considerable extent segregated as to size in the swift currents, so that from point to point it is noticeable that the pebbles and grains of sand differ in shape as well as in size. Often the dividing line between two or several adjoining deposits is remarkably well defined.

The Trinity river flowed over many different outcrops of rock, with the result that the amount and kind of materials contributed to the stream load have differed. This is exemplified by the difference between the upland gravel deposits and those found in the present flood plain of the river.

The upland gravel deposits are not as valuable as the flood-plain deposits, as they carry great quantities of foreign materials, such as clay, mud, soft limestone, chalk pebbles, etc., well mixed with rather poor grades of sand and gravel. However, the raw material from these deposits makes excellent driveways or country roads where traffic is light, due to the natural binders contained in the gravel.

The flood-plain deposits where proved to contain material of sufficient quality and quantity to justify exploitation on a large scale are very valuable. They are usually free from foreign material such as soft limestone, chalk pebbles, mud, clay and silt and therefore may be mined and made into a finished product with a minimum of expenditure.

Gravel deposits in this locality, and, for that matter, throughout northeastern Texas, are small, usually not exceeding 40 or 50 acres in area and averaging 20 to 25 acres. However, a number of these deposits are often found close together. The deposits are also comparatively shallow. The upland deposits have practically no overburden and are from 3 to 5 ft. thick, whereas the flood-plain deposits are covered with 8 to 12 ft. of soil and clay overgrown with trees and brush, and vary from 8 to 20 ft. in thickness. The deposits are usually underlaid with a hard blue shale or a stratum of solid limestone. However, in many cases the base of the gravel beds is a hard clay.

The beds themselves are composed of silica and limestone in the form of sand and pebbles, both of which are uniform in texture throughout. The sand is angular and hard, and the pebbles are also hard, well formed and of the right size for a number of uses.

Prospecting and Exploration

Locating gravel deposits on the upland is a comparatively simple matter, as the gravel sometimes outcrops or is usually detected in the soil within a few inches of the surface, or is exposed in gully washes along the banks of small streams that drain the high ground. Often the upland deposits are found accidentally in digging post holes.

Locating gravel deposits on the flood plains is more difficult, as the gravel is covered by 8 to 12 ft. of clay and soil and prospecting is expensive as the clay is both hard and deep. Further, commercial deposits are seldom discovered, even though a prospector may spend months in sinking holes with a boring machine or digging prospect shafts.

When a deposit has been located, it is usually explored by means of test pits dug by hand to the top of the gravel. If the pit is dry, hand digging may be continued through the deposit. Where this method is used, one man to a hole is all that is necessary for the first 7 ft. of depth. From this on, there are two men to the hole, which is usually 3 by 5 ft. in cross section through the overburden.

One man on the surface lays a plank across the hole to stand on and uses a 1-in. rope (large enough to keep from burning the hands while gripping it), to hoist a steel bucket that holds about ½ cu. ft. of gravel.

The man in the hole digs and loads material into the bucket. When the surface of the gravel deposit has been reached, it is well to change from a 3 by 5-ft. oblong hole to one that is round and about 3 ft. in diameter. If the gravel is not too loose, the man in the hole will be safe in going down in the gravel to a depth of 10 to 12 ft., or to 20 to 25 ft. below the surface. Should the gravel be extremely loose, a specially constructed steel curb, in sections, should be used for the protection of the man in the hole.

*Reprinted from U. S. Bureau of Mines Information Circular 6537.

Machine for Drilling Test Hole

One gravel company in this vicinity has a boring machine, similar to a post-hole auger on a large scale, that is mounted on and operated by a Fordson tractor. This machine bores a hole about 16 in. in diameter through the clay overburden at the rate of 1 to 5 ft. per min., depending on the hardness of the clay; and in case the hole caves, the auger can be pulled by reversing the direction of rotation.

The machine drills in clay to a depth of about 18 ft. without difficulty, but it does not work so well in the gravel because of the continual falling of pebbles, which causes many cave-ins. For this reason drilling is stopped immediately upon striking the gravel, and the hole is continued by using a small orange-peel bucket, operated by hand, inside a 14-in. steel casing. This is a good outfit for working in loose gravel above the water line. When the water is struck, faster progress may be made by using a flap-valve bailer (bailing bucket used in bailing oil wells, or other deep wells). The bailer used for sinking through gravel under water is operated inside of a 10-in. pipe. It is usually 8 in. in diam. and is fitted on one end with a 3-pronged, hard-tempered cutting edge. Should the bailer be operated by hand, it should not be more than 2 ft. long. As many as 8 men, working 6 at a time, will be needed to make the best progress.

The bailer is suspended from a light derrick, mounted on a sled, and is worked up and down by a 1-in. rope running through a pulley at the top and one near the base. The derrick on the sled is moved by team, tractor, or by the crew of 8 men.

The bailer when used on a self-moving well-drilling machine of the cable type, has proved successful in testing gravel deposits which lie below the water. Two men can operate this equipment to good advantage, and they can usually drill from 70 to 80 ft. in 10 hrs.

The gravel deposits near Bois D'Arc, now being worked by the East Texas Gravel Co., are typical flood-plain deposits with all the peculiar characteristics so noticeable in the many other similar deposits lying close to the Trinity River which are being worked by other operators.

The East Texas Gravel Co.'s deposits cover several hundred acres and the overburden of clay ranges between 4 and 12 ft. The sand and gravel have a depth of from 10 to 15 ft. The pit-run material averages about 45% sand and 55% gravel, and is fairly clean. The deposit lies below the normal water level which comes up to the base of the clay overburden.

The materials, both sand and gravel, in these deposits, are of exceptional quality; being free from mud, clay, soft limestone, chalk pebbles, etc., and particularly free from a medium-soft white limestone pebble such as is mixed in small amounts with the sand and gravel from pits some 50 miles further up the Trinity River. The sand is angular, coarse, and hard, and is prepared by washing and sizing so that it meets practically all specifications, especially for concrete construction of different kinds.

The gravel is hard and tough, and particularly well adapted, to use in concrete construction. It also fully meets specifications required by the Texas Highway Department and federal engineers for the construction of concrete slabs and hard-surface tops of permanent highways.

The gravel and sand are thoroughly washed and rinsed, and sized to meet specifications for many different projects.

Only a small percentage of the gravel exceeds 3 in. in size, and for this reason no crushing is necessary. All of the oversize is sold to the railroads, or to contractors who do their own crushing on special jobs.

A screen analysis on an average sample of washed sand for concrete is as follows:

Screen size	Per cent.
On ½-in.	00.0
On ¼-in.	18.0
Through ¼-in.	82.0
On 10-mesh	33.6
On 20-mesh	54.2
On 30-mesh	76.6
On 40-mesh	89.2
On 50-mesh	95.6
On 60-mesh	97.2
On 80-mesh	97.9
On 100-mesh	98.2
On 200-mesh	98.3
Through 200-mesh	1.7

An analysis of an average sample of washed gravel for concrete is as follows:

Screen size	Per cent.
On 2-in.	00.0
On 1½-in.	1.5
On 1¼-in.	7.1
On 1-in.	19.1
On ¾-in.	45.3
On ½-in.	72.7
On ¼-in.	94.6
Through ¼-in.	5.4
On 10-mesh	99.5
On 20-mesh	.5

Stripping and Mining

Removal of clay overburden and excavation of raw pit gravel is done by a Monighan walking dragline with an 85-ft. boom and a 3-cu. yd. bucket. This machine is powered by a 175-hp. Fairbanks-Morse Diesel engine belted directly to a shaft with clutches connecting with two drums on the hoist used for dragging and hoisting the bucket. There is also a belt to an electric generator which supplies current for a 50-hp. motor drectly connected by pinions and gears to a circular rack for swinging the machine.

The dragline is put to work at any desired location in the pit, and first removes the overburden of clay which it casts to one side, usually at about 90 degrees from the direction of the loading truck. After the overburden has been removed from about 5,000 sq. ft., the dragline proceeds to remove the pit gravel and places it in standard-gage, bottom-dump, 50-ton steel cars, for transport to the Texas and New Orleans Railroad Co.'s track to Bois D'Arc. From there it is transported to designated points along the main line and used for ballast.

The ballast cars are often utilized for transporting the pit gravel as loaded by dragline to the hopper at the washing plant. The ballast ars are spotted, one at a time, over the hopper and dumped.

Screening Plant

The raw material is fed from the hopper by a plate feeder on to an 18-in. belt conveyor that carries the material to the top of the washing plant over a head pulley shown in Figs. 1 and 2. Fig. 1 shows a side elevation of the wash-

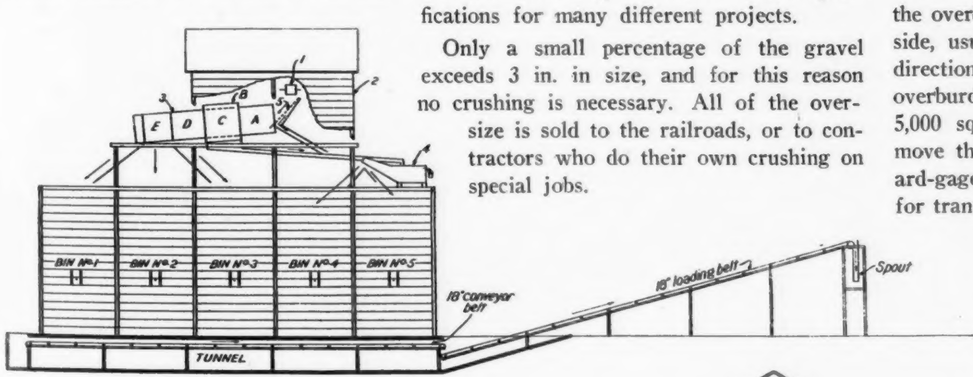


Fig. 1. Side elevation of bins

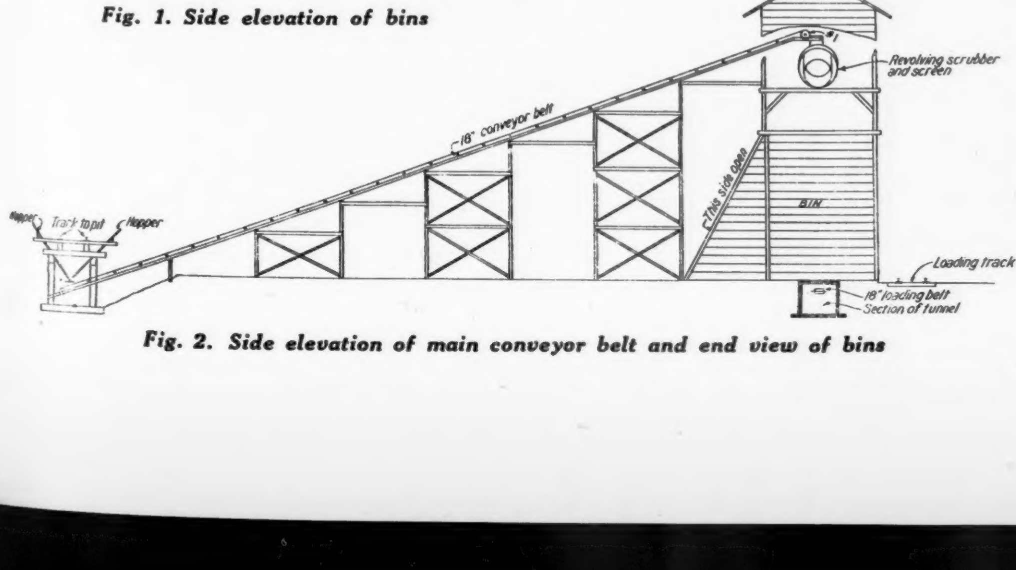


Fig. 2. Side elevation of main conveyor belt and end view of bins

ing plant and a longitudinal section of the tunnel under the bins. Fig. 2 shows a side elevation of the conveyor belt from the hopper, end view of bins and cross section of hopper and tunnel under bins. The top portion of the house which covers the belts and electric motors that drive the 18-in. conveyor belt, revolving scrubber and screen is shown at 2, Fig. 1.

From the head pulley (1) at the top of the plant the pit gravel is sluiced over an inclined screen (5) of ⅛-in. steel wire having ⅜-in. square openings.

The undersize from this goes directly to the two sand classifiers (4) thus relieving the revolving screen of this burden and thereby speeding up production.

The oversize from the inclined screen is flushed into the revolving scrubber and screen (3) which is 18 ft. long and 4 ft. in diameter, and is surrounded midway by a wire jacket, B, 6 ft. in diameter and 9 ft. long. The jacket is made of ⅛-in. steel wire with ⅜-in. square openings for the first 5 ft. of its length and ½-in. square openings for the remaining length of 4 ft. The scrubber portion of the revolving screen A, is on the receiving end and is 5 ft. long. It is followed by sections C, D and E, which are 6, 4 and 3 ft. long and have ⅝, 1⅜ and 3-in. round perforations, respectively.

The sand and water passing through the screen jacket are sluiced to two sand classifiers (4), placed side by side. The classifiers wash, size, dewater, and deposit the sand in bins 4 and 5. The sand classifiers are of the box type, with long sloping necks in which sand drags are operated. Each sand drag consists of two parallel chains mounted on cast-steel sprocket wheels and connected by steel plates ⅜-in. thick, 5-in. wide, and 30-in. long.

The sand drags, driven by gear and pinion, agitate the sand and keep dirt, silt, etc., in suspension to float off with the water, while the sand is dewatered and dragged out through the neck of each classifier.

Returning to the revolving scrubber and screen, we find that the inclined screen ahead of it and the jacket have removed most of the sand and water, leaving only the pebbles to be screened into three sizes and chuted to their respective bins.

Referring to Fig. 1, bin 3 is for pebbles that pass through a ⅝-in. ring and are retained on ⅜-in. square mesh opening. Bin 2 is for pebbles through 1⅜-in. and over ½-in. Bin 1 is for pebbles through 3-in. and over 1⅜-in. The different sizes may be loaded out individually into cars through the gates on the side of each bin, or may be remixed in any desired proportion in a trough immediately under the revolving screen and from there spouted directly to the cars on the loading track for shipment.

In many instances where it is necessary to be more particular about the proportions of the several sizes, mixing is accomplished by use of the loading belt as follows:

Underneath the bins as shown in Fig. 1 and 2 is a tunnel having a 7-by-7-ft. inside cross section and running parallel with the longitudinal axis of the plant. At intervals along the roof of tunnel, which forms a portion of the bottom of the bins, there are gates spaced from 10 to 12 ft. apart along the center line. An 18-in. conveyor belt traverses the entire length of the tunnel, and the flow from the bins onto the conveyor belt is regulated by adjusting the bin gates to produce any desired specification. Small hoppers straddling the conveyor belt are placed beneath the various bin gates to guide the discharge.

After passing out of the tunnel the gravel is discharged onto another conveyor belt which rises to a point high enough to permit spouting the material over an inclined screen where it is sprayed with water with sufficient force to thoroughly rinse off the gravel before it is finally placed in the car for shipment.

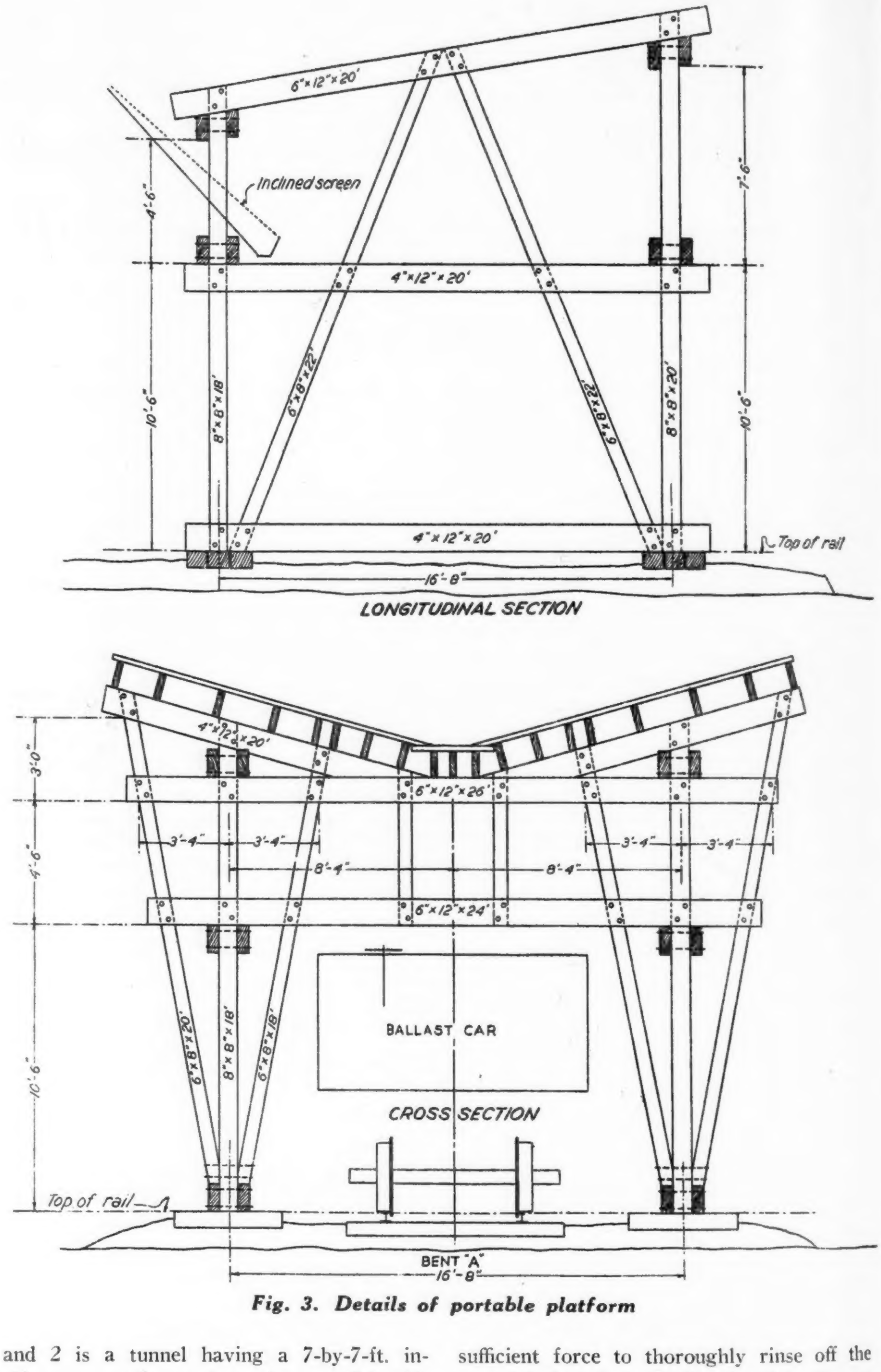


Fig. 3. Details of portable platform

Removing Surplus Material at Pit

Using the small dragline machine at the washing plant to stack pea gravel and sand in stock piles, as well as to reclaim it and load it out quickly, has been found to be a most advantageous method. When the sand and pea gravel have been stocked in piles near the washing plant to the capacity limit of open storage, the handling and rehandling of these materials eventually became a problem, for in addition to being hauled to the plant and carried through the regular process of being washed it was necessary to load them from bins to cars or from storage to cars and finally to dis-

pose of them by dumping as waste somewhere along the line.

At first this was not a bad arrangement, as these materials when mixed make an excellent track ballast, and were utilized for this purpose. However, when all the track had received an adequate amount of this ballast, the continued dumping of these materials became not only a problem of finding a place to dump them, but also an expensive operation.

The disposal of the pea gravel and excess sand eventually became an acute problem and a method was worked out to dispose of all undesirable materials at the pit by removing them from the desirable materials and discharging them as waste into the pond formed by previous workings.

This method utilizes a portable loading and washing platform loaded by the Monighan walking dragline for eliminating the undesirable materials, such as large stones and big chunks of clay or mud, etc., as well as pea gravel and sand that is overabundant in the pit gravel.

Large stones and big chunks of mud and clay are removed from the platform by hand, and the sand and pea gravel are washed away by water that sluices them through an inclined screen and thence by flume back to the excavated areas of the pit. The oversize on the inclined screen rolls into standard-gage steel ballast cars for transport to the washing plant. This method of treatment eliminates the haul on waste material, relieves congestion at the plant and speeds up production of those products for which there was a ready market.

Details of Portable Platform

Fig. 3 shows construction of the portable platform. The standard-gage ballast cars pass under the platform, and the floor of the platform slopes two ways, toward the center and also toward an inclined screen at one end. The raw pit gravel is placed directly by dragline onto the platform floor, which is covered with 10-gage steel plates laid in "rainproof" fashion.

Across the inclined screen and some 18 in. above it, several 3-in. pipes are placed, each perforated on one side with ¼-in. holes about 1 in. apart, through which water under pressure is sprayed on to the screen.

When the raw pit gravel is placed on the platform the water which is played on it through a small hydraulic giant floods the gravel and sand down grade to the inclined screen which has a pitch of about 45 deg. This pitch is sufficient to make the oversize roll off into the car while the sand and pea gravel are washed through the screen by the force of the water sprays and sluiced through a flume, made up of 25-ft. portable sections, to the worked-out portion of the gravel pit. There it may be picked up again on the next pass with the dragline or left as waste along with the overburden.

To move the portable platform, four timbers each 8 by 8 in. by 12 ft., a few blocks each 8 by 8 in. by 2 ft., and two good track jacks, are required to raise and block it up on one of the ballast cars. A special pocket was built into the portable platform to hold the timbers, blocks, and jacks so that they are always available when needed.

One of the ballast cars is used for a moving van, so to speak, by spotting it on the loading track directly under the platform. The four timbers are then placed across the car, two at each end of the platform immediately under the horizontal cross timbers of the platform that are about 18 in. above the top of the ballast car. Both jacks are set, and one end of the platform is raised and blocked on top of the car, leaving its legs at that end some 8 in. or so above the foundation blocks. In like manner the other end of the platform is raised and blocked and the whole structure, then clear of all foundation blocks and resting on the ballast car, may be moved by the locomotive to a new location for further use or it may be taken to the end of the loading track to remain completely out of the way until it is again needed.

Water for use on the portable platform is plentiful, there being 10 or more feet of it standing in the pit at all times. A 6-in. centrifugal pump powered by a 30-hp. gasoline engine is used to pump the water through a 6-in. pipe to the top of the platform. The centrifugal pump and gasoline engine remain more or less stationary, but the 6-in. pipe laid parallel to and about 10 ft. away from the track, is shifted each time the loading track is moved over for the new pass of stripping and loading.

Summary of Costs

The operating costs during the period from July, 1929, to July, 1930, are shown in the accompanying table.

Total material loaded during period: Overburden, 110,000 cu. yd. moved by dragline into pond formed by previous workings. Sand and gravel, 123,500 tons.

OPERATING COSTS PER TON OF SAND AND GRAVEL MINED

	Labor	Supervision	Power	Fuel	Other supplies	Total
Stripping	$0.025	$0.002	......	$0.010	$0.022	$0.059
Mining and loading	.049	.005	$0.002	.002	.051	.109
Transportation	.032	.001	......	.014	.002	.049
Washing, screening and loading	.080	.010	.002	......	.003	.095
Storage	.005	......	......	.001	.005	.011
Repairs and maintenance	.020	.001	......	......	.110	.131
Miscellaneous	.006	......	......	......	.005	.011
Total	$0.217	$0.019	$0.004	$0.027	$0.198	$0.465

Reports High Quality of Kaolin in North Carolina

DR. W. F. PROUTY, of the geology department of the North Carolina state university, in conjunction with State Geologist H. J. Bryson, has been conducting extensive investigations of the kaolin deposits of Mitchell county, N. C., and reports that some of the more recently prospected areas near Spruce Pine have yielded a grade of kaolin superior to the best English china clay. In this district there are many areas where great masses of injected pegmatite have been deeply weathered and changed into pure white kaolin.

Dr. Prouty is of the impression that the area about Spruce Pine contains the richest deposits of this clay in the United States. It is in this area that the most rapid development of kaolin is taking place at the present time, he said.—*Asheville* (N. C.) *Citizen.*

New Pavement Awards

CONCRETE PAVEMENT yardage awarded in the United States during the month of September, divided according to roads, streets and alleys, as reported by the Portland Cement Association, and the totals for the nine months' period ending October 3, 1931, are:

	Yardage awarded September, 1931	Yardage awarded To October 3, 1931
Roads	6,182,115	101,596,882
Streets	2,443,639	18,477,352
Alleys	76,431	680,251
Total	8,702,185	120,754,485

Sues City for Unpaid Sand and Gravel Bills

THE CITY of New Orleans, La., has been sued in federal court by the American Sand and Gravel Co. of Hattiesburg, Miss., for $3062.93, said to be money due for 50 carloads of topping sand and washed gravel. According to the petition, the company delivered the sand and gravel between January 17 and April 1 of this year and has made repeated requests for payment but to date has received no answer from the city.

The petition asks that the full amount be awarded the petitioning company to which should be added 5% interest and all costs of court.—*New Orleans* (La.) *States.*

Standard Silica Co. Plant Destroyed by Fire

DAMAGE estimated at from $75,000 to $100,000 was caused October 26 by a spectacular fire which destroyed the plant of the Standard Silica Co., west of Ottawa, Ill. The origin of the fire, which was seen for 25 miles, was not determined.—*Chicago* (Ill.) *Tribune.*

Recent Concrete Paving Tests of Bureau of Public Roads

A Critical Analysis

By Edmund Shaw
Contributing Editor, Rock Products

AN ALTOGETHER NEW feature of the tests of highway concrete by the U. S. Bureau of Public Roads (published in ROCK PRODUCTS for October 24, 1931) is the establishment of a new criterion for what the paper says is "the most elusive property of concrete, which we call workability." It is that of estimating the percentage of honeycomb in the slabs, both on the bottom and the end exposed by breaking. Given more than a small percentage of honeycomb the concrete is declared to have been unworkable.

There would be no objection to this if it could be shown that honeycombing was directly dependent on the mix and characteristics of the aggregate. But, as the paper says, workability is wholly comparative, and a mix pronounced unworkable in the laboratory might be quite workable under job conditions, and vice versa. In other words, honeycomb depends on workmanship as well as on the mix. And there may be some other factors affecting it. This is not only the writer's opinion but that of engineers who are in the business today and who have been asked for an opinion either directly or by correspondence.

There is evidence in the tests themselves that other factors than the mix and the characteristics of the aggregate affected the amount of honeycombing. The most striking examples of honeycombing are in the 1:2:3½ mixes made with "B grading" gravel. This is shown by the following figures which were taken from tables No. 5 and No. 13 in the paper, both omitted from the abstract published in ROCK PRODUCTS on account of their length.

The figures of the individual sections disclose some things that are not shown by the averages. Of the 12 sections in the table four had no honeycomb, five had a low percentage, from 0.9% to 5.0%, two had a fairly high percentages, 8.2% and 13.5%, and one a very high percentage, 20.5%.

A similar tabulation was made of the 1:2:4 mix "B grading gravel" which showed quite as wide a range of honeycombing. Two slabs had no honeycombing, seven had low honeycombing, from 0.4% to 3.2%, one had a moderately high percentage, 7:5%, and two had the very high percentages of 17.8% and 38.2%.

It is difficult to account for such variations as these by the amount, character and grading of the coarse aggregate. It must be remembered that the greatest care was taken to insure the same proportions of separated sizes and it seems impossible that the sand could have varied so much as to cause such variations. The one consistent feature is that high percentages of honeycomb are found with a rather low water content. Still, it is difficult to see why (as shown in the table below a water-cement ratio of 0.84 and a slump of ¾-in. should make 20.5% honeycomb in one case and the same water-cement ratio and 1-in. slump should make 5% honeycomb in another. The cement factor was 5.60% in both cases.

There is no such variation or range as this in the concrete made with either grading of stone for the 1:2:3½ and 1:2:4 mixes. All of them gave high strengths in flexure and compression, even the very dry mixtures. A somewhat astonishing example is that of a stone concrete with a water-cement ratio of 0.75 and a slump of ¼-in., which had only 2.2% honeycomb. The next lowest water-cement ratio was 0.80 with a ½-in. slump, which had 8.4% honeycomb.

The figures that show such a wide range of honeycomb for the gravels with low water ratios would indicate that stone concretes are much more workable with dry mixes than gravel concretes. But this is a conclusion that anyone familiar with aggregates would be slow to accept, since there is so much evidence that this is not true. The paper notes the difficulty of molding beams from the stone concretes, which would indicate that they were not quite so workable as the percentage of honeycomb would show them to be. From this it would seem that there are other factors making honeycomb than those which the paper accounts for, even though the general trend which it mentions is so plain.

But the danger of over dry mixes is very plainly shown and the paper is rightly emphatic on this point. Too much consideration of strength alone has been responsible for carrying the water content of many concretes too low. It appears to be possible to make concrete that will be satisfactory as to strength and that is workable enough to be placed which will have a fairly high percentage of honeycomb. No. 53 and No. 180 in the table above are examples. Recent studies on the permeability of concretes have indicated that strong concrete made with a low water ratio may be so permeable as to be unsafe to use in exposed places in a cold climate.

Grading

The gradings of the complete aggregates are not given in the paper, but since it is these, and not the gradings of the separate materials that affect the characteristics of the concrete, they have been figured from the data in the paper and an approximate plot is given here. No one of them plots as a smooth curve. The grading of the complete aggregate made with "B grading" gravel is the poorest of the three, as it shows a decided hump at the point where the sand and gravel meet.

In the study of grading made by Gilbert and Kriege (ROCK PRODUCTS, June 21, 1930) it is said that good grading of complete aggregate should not have less than 21% nor

GRAVEL, B GRADING, 1:2:3½ MIX

Sec. No.	W/C ratio	Slump ins.	Cement factor	Modulus of rupture of slabs 1	2	3	4	Av.	% Honey-comb	Finish
19	0.89	1	5.54	611	565	613	647	609	0.9	A
20	0.93	2¼	5.50	627	570	586	578	590	0.0	A
21	0.90	1¼	5.52	599	548	572	602	580	0.0	A
52	0.84	¾	5.60	531	470	447	339	447	20.5	C
53	0.89	1½	5.54	613	565	596	510	571	8.2	C
54	0.93	2¾	5.50	613	558	565	552	572	0.0	C
146	0.84	1	5.60	519	587	599	568	568	5.0	C
147	0.89	1½	5.54	587	570	519	609	579	2.9	C
148	0.94	2¾	5.49	632	616	626	611	621	0.4	C
179	0.89	2	5.54	626	613	666	657	640	3.0	B
180	0.85	1	5.39	571	563	518	556	552	13.5	B
181	0.94	2¼	5.49	601	600	619	612	608	0.0	B

more than 29% between ¾-in. and No. 10 sieves. The A grading just falls within this limit with 28%. The B stone grading lacks somewhat, having only 17%. But the B gravel grading had a very large excess of this fraction, 51%. The flatness of the sand portion of the curve between No. 4 and No. 30 sieves is another noticeable characteristic of the curves and this tended to make the hump where the sand and coarse aggregate join. The sand was high in 30- to 50-mesh grains and some specifications might have refused it on this account.

With such gradings it is not surprising that there were some erratic results in both strength and workability as shown by the percentage of honeycomb. But these are well discussed in the paper.

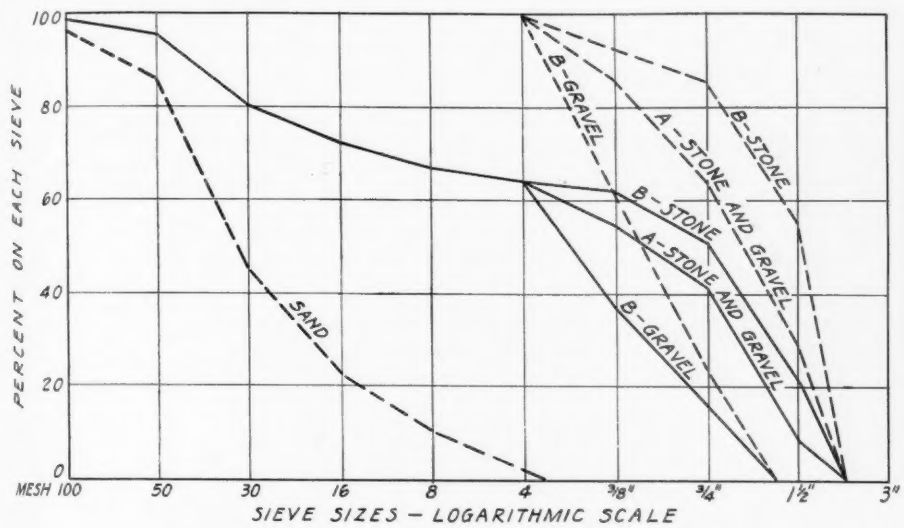
The permissible fineness modulus for the maximum size as given by Abrams was exceeded in all the mixes which had more than four parts of coarse aggregate. A cursory study of the strengths and workabilities of the concretes indicates that both were affected but not so much as one would suppose they would be. On the whole there is a wider variation from the average strength in the concretes with more than four parts of coarse aggregate and this is more noticeable with the stone than with the gravel concretes, for with the gravel concretes there were wide variations in strength that cannot be explained by the mix alone. One would judge from these results that attempts to decrease costs by adding more coarse aggregate than ordinary practice allows should be made cautiously if they are to be made at all.

Effect of Type of Coarse Aggregate

Three types of coarse aggregate were used, stone, gravel and slag. So few tests were made with slag aggregates that it has not been compared with the other aggregates here. In the tests made it compared favorably with stone except that the modulus of rupture was somewhat lower.

No attempt was made in the paper to compare the effects of types of coarse aggregate, but of course every reader who is interested will make such a comparison. All that it seems necessary to say is that the results might have been entirely different if different coarse aggregates had been chosen. This is shown by the earlier tests made by the bureau in which types of coarse aggregate mixed in identical proportions were directly compared. From the physical characteristics of the aggregates given in the paper it appears that the stone and the gravel selected represent the types which gave high and low results in the earlier tests.

It is to be noted that in both tests the fine and coarse aggregates were combined by arbitrary proportions. With this method and identical gradings gravel is always at a disadvantage because of lower voids and consequently a lower cement factor. Had some of the design methods worked out by Goldbeck, Jackson, Walker and others, or one of the methods used by some state highway departments, as California or Michigan, been used, different results might have been expected.



Grading chart of various aggregates used

Conclusions and Recommendations

There are 12 important conclusions drawn by the authors of the paper. The first and second confirm many other observations of the water-cement ratio law. The third says that the workability, and uniformity of strength, decrease in proportion to the amount of coarse aggregate added, in other words when the fineness modulus exceeds the permissible fineness modulus.

The fourth conclusion is perhaps the most important to aggregate producers. It says that the workability of the concrete was greatly reduced by decreasing the maximum size and at the same time increasing the fines in the gravel coarse aggregate, even though the corresponding variations in the percentage of voids in the gravel and in the value of $\frac{b}{b_0}$ for the concrete were small. The fifth conclusion is along the same lines, as it says that poor grading in the gravel affected the workability more than adding coarse aggregate to the well graded material.

With this it is only fair to point out that this conclusion does not say that gravel with a low maximum size cannot be as workable as gravel with a high maximum size. Well graded gravel 1½-in. down should be just as workable as well graded gravel 2-in. down. The recent work of Anderegg on grading tends to show that workability depends upon the grading of the whole mix, including the cement, and that humps in the plotted curve mean less workable mixes.

The sixth and seventh conclusions are interesting, as they show the slump tests measured the workability of the concrete, but that different gradations of gravel produced different degrees of workability for the same slump. However, it appears from the eighth and ninth conclusions that a slump of 2- to 3-in. is considered sufficient. The recommendations cover this point. It is recommended that specifications for concrete for pavements contain a consistency requirement, preferably measured by the slump test, and that the slump should be from 2 to 3 in. This recommendation and the conclusions on which it is based are perhaps the most important things that have been brought out by the tests.

Resumes Construction on Gravel Plant

CONSTRUCTION MATERIALS CORP., Chicago, Ill., has resumed work on its $1,000,000 construction program at Grand Haven, Mich., on which work was halted for a few weeks during the summer.

The electrical equipment for the conveyor system is being received now and a quantity of work yet remains on the project which has been under way for many months. The conveyor system is to be housed in steel sheeting and more buildings are to be erected before the project is complete. Charles M. Rudow is in charge.

It is expected now that work will continue all winter with the new plant in readiness for business next spring. The production of the gravel company this year about equals that of last year, or 600,000 tons.—*Michigan Contractor and Builder.*

Plans Sand Washing Plant in California

R. D. MILLER, organizer of the Pacific Coast Sand and Silicate Corp., has started operations in the hills back of Byron, Calif., where a steam shovel has been moved to develop sand deposits.

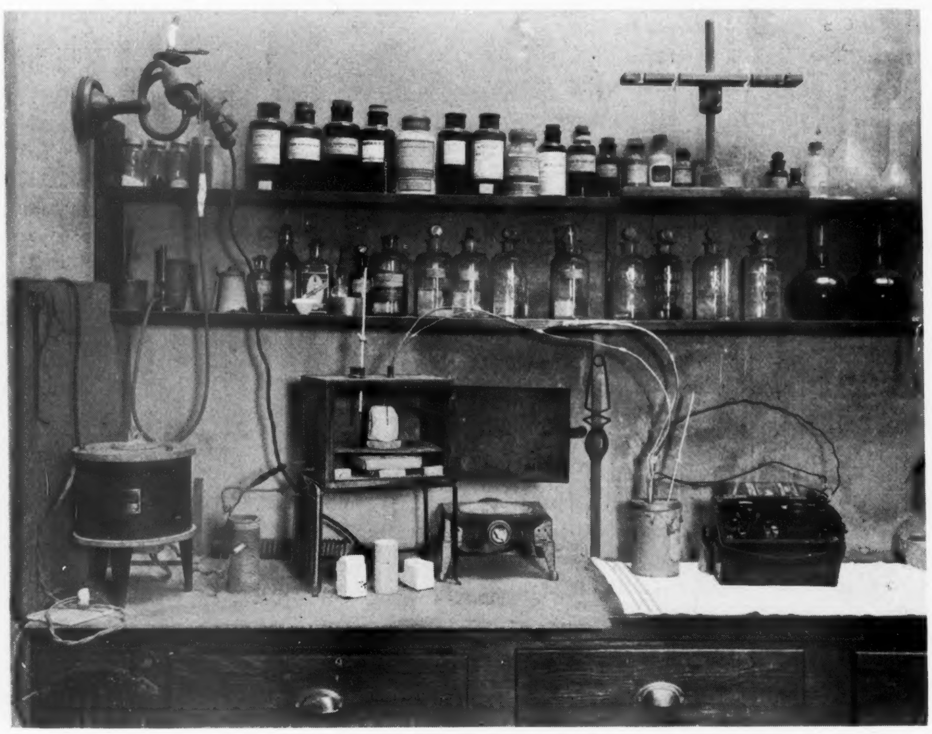
Mr. Miller, who has offices at 369 Seventeenth St., Oakland, plans the erection of a washing plant.

Ten acres of land have been surveyed and final purchase will be made soon.—*Martinez Contra Costa Gazette.*

The Rate of Calcination of Gypsum

By Wallace C. Riddell
Consulting Chemical Engineer, Standard Gypsum Co., Inc., San Francisco, Calif.

PRACTICALLY no information is available on the rate of calcination of gypsum, $CaSO_4 \cdot 2H_2O$. Numerous contradictory data are available in various articles published on the temperature at which gypsum loses its combined water. Honus (Otto Honus, *Zement* 1201-1204, 1927, reprinted in ROCK PRODUCTS, February 18, 1928) has reviewed the literature on this subject. His references and abstracted data indicate that the several investigators vary widely in their determinations of the temperature of decomposition of gypsum, ranging from 110 deg. C. to 170 deg. C. (230 deg. F. to 338 deg. F.).



Set-up of apparatus used

Krauss and Joerns (*Tonindustrie-Zeitung*, 1930, 54, pp. 1467-68; 95, pp. 1483-84) found that decomposition from $CaSO_4 \cdot 2H_2O$ to $CaSO_4 \cdot \frac{1}{2}H_2O$ at 7mm. pressure takes place at 59 deg. C. (138 deg. F.) and that practically complete dehydration takes place at 125 deg. C. (257 deg. F.). According to van't Hoff, $CaSO_4 \cdot 2H_2O$ is transformed into $CaSO_4 \cdot \frac{1}{2}H_2O$ at a temperature of 107 deg. C. (224.6 deg. F.).

Brednikoff (*Pit and Quarry*, April 11, 1928, pp. 72-76) states "that there is no exact transition point between the various hydrates (of $CaSO_4$), which means that the corresponding curves cannot be definitely established. The phase rule alone gives only little information when studying the system $CaSO_4 + H_2O$. Within the temperature range from 0 to 110 deg. C. all our phases, $CaSO_4 \cdot 2H_2O$, $CaSO_4 \cdot \frac{1}{2}H_2O$, $CaSO_4$ soluble and $CaSO_4$ insoluble, can exist together. There is no constant region of existence for any hydrate."

In the technical calcination of gypsum to form, as nearly as practical, the hydrate $CaSO_4 \cdot \frac{1}{2}H_2O$, there seems to be a fairly uniform temperature of decomposition. A study of numerous recording thermometer charts from the kettles at several gypsum plants indicates that decomposition takes place at 120 deg. C. (248 deg. F.) when the temperature is determined near the top of the kettle, and 127 deg. C (260 deg. F.) when determined at the bottom.

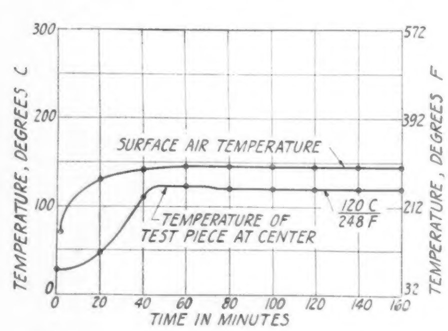


Fig. 1. Curve for gypsum specimen

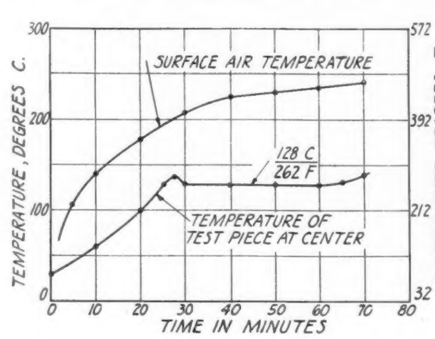


Fig. 2. Curve for gypsum specimen

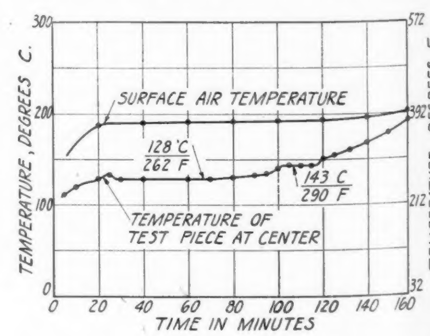


Fig. 3. Curve for gypsum specimen

Cross-sections of partially calcined gypsum test pieces

Experimental work on the rate of calcination of gypsum indicates that calcination proceeds from the outside of the piece under test inward over a very narrow zone; and that the rate of progress of this zone depends primarily on the temperature surrounding the test piece. Various samples of rock gypsum were tested from widely separated quarries, both coarsely crystalline and crypto-crystalline specimens.

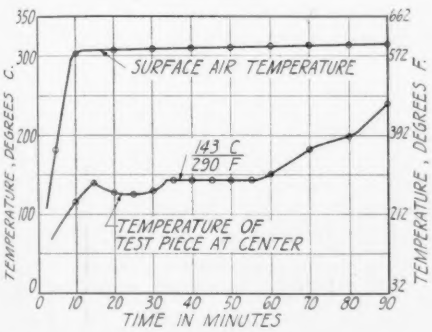


Fig. 4. Curve for gypsum specimen

Data is here given for the rate of calcination or for the rate of advance of the line of calcination, and data is also given for the temperature of decomposition of gypsum for several surrounding air temperatures. In making these determinations a small electric oven was used. Temperatures were measured with a Leeds and Northrup potentiometer, using carefully standardized 22 gage copper constantain thermocouples. The set up of the apparatus is shown in one of the accompanying illustrations and also in another is shown the cross sections of several partially calcined gypsum test pieces.

Figs. 1 to 4 inc. are time-temperature curves showing the decomposition temperatures of different specimens of gypsum. Fig. 5 is a time-temperature curve for practically pure anhydrite. Fig. 6 is a plot of a typical log for the calcination of gypsum in a standard 10-ft. by 10-ft. kettle. Fig. 7 gives

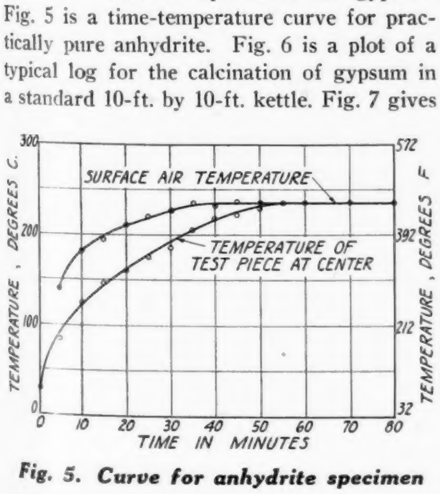


Fig. 5. Curve for anhydrite specimen

the relationship of temperature to the rate of penetration of the zone of calcination.

Figs. 1 to 4 show that the temperature at the center of the test pieces varies with the surface or surrounding air temperature. It has also been observed in calcination by the kettle process that the boiling temperature varies with the time required for calcination which is dependent on the surrounding gas temperature. It is quite evident from these plotted curves that in the practical calcination of gypsum the temperature of decomposition varies with the surrounding temperature.

From Fig. 6 the approximate time required to calcine a given sized piece of gypsum can be calculated. As the rate of penetration of the zone of calcination is constant for any given temperature, over the complete period of calcination, the time required will be directly proportional to the size of the piece. The zone of calcination is in most cases a very sharp and distinct line.

The illustration showing the sections of

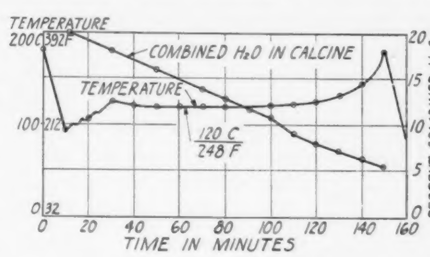


Fig. 6. Typical log of calcination in standard kettle

partially calcined test pieces indicates quite clearly the line of demarcation between calcined gypsum and the core of uncalcined material. The combined water in the core in several samples tested had the same combined water content as the original unheated rock. The combined water in the calcined material varied with the surface temperature.

The accompanying table gives the data on 16 test pieces.

The data given on the rate of penetration of the zone of calcination indicate that for

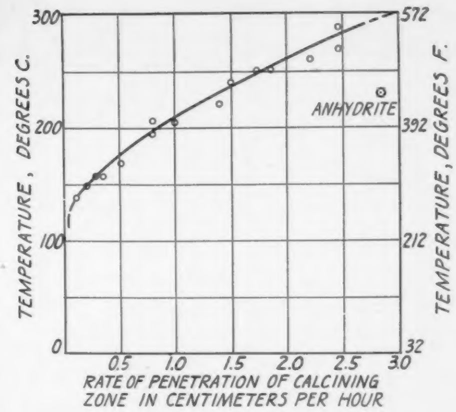


Fig. 7. Relation between temperature and rate of calcining

practical purposes the temperature of decomposition for gypsum is approximately 128 deg. C. (262 deg. F.).

Commissioner Violates Injunction in Fight Against Quarry Blasts

FOLLOWING his order of closing the stone quarry of the Hudson County Crushed Stone Co., in North Bergen, N. J., Commissioner Harry Buesser, director of public parks and playgrounds, ordered the arrest of two workmen at the quarry for drilling holes in the ledge larger than those permitted by municipal ordinance.

They were released in bonds of $100 each, pending arraignment.

Shortly after the arrest of the two men a heavy blast was set off at the quarry. It was later learned that Commissioner Buesser was at the quarry at the time of the blast.

Officials of the crushed stone company have not yet taken any action regarding Commissioner Buesser's violation of an injunction issued to prevent interference with operations at the quarry by prohibiting men from working at the quarry.—*Union City (N. J.) Hudson Dispatch.*

DATA ON RATE OF CALCINATION OF GYPSUM

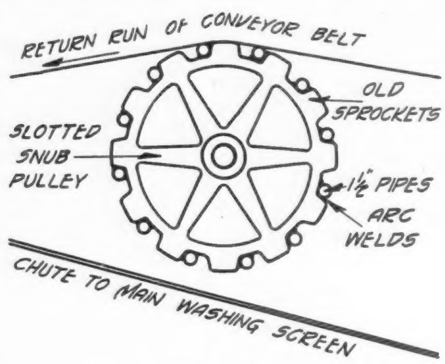
Test No.	Time mins.	Temperature deg. C. Surrounding air	Temperature deg. C. Center of sample	Penetration line of calcination cm. per hr.	Combined H_2O in calcine
1	60	195	120	0.8	3.20
2	90	205	125	1.0	4.50
3	300	140	120	0.12	6.86
4	90	170	120	0.53	6.00
5	60	220	125	1.40	3.90
6	60	260	128	2.20	2.46
7	45	250	128	1.73	2.20
8	60	205	125	0.80	5.10
9	30	295	128	2.80	......
10	60	160	122	0.30	5.96
11	180	150	125	0.22	......
12	60	160	127	0.35	5.80
13	60	250	128	1.85	4.30
14	60	240	128	1.50	2.60
15	30	270	128	2.40	......
16	30	290	128	2.45	2.05

Hints and Helps for Superintendents

Removing Damp Sand from Conveyor Belts

By Ernest Moyer
Alturas, Calif.

MATERIALS such as damp sand often cling to a belt conveyor after it has gone around the head pulley and have a tendency to build up on the return rollers and cause trouble.



Damp sand can't cling to this pulley

This was overcome at one plant by removing the usual solid snub pulley just below and back of the head pulley and substituting a special slotted pulley made up of pipes and old sprockets. This pulley was made by mounting two old sprockets on the shaft and then welding pieces of 1½-in. pipe to the sprockets as indicated in the accompanying illustration.

The arrangement proved very satisfactory in removing the damp sand from the belt.

Stripping Economies in a Gravel Pit

AT THE FOREST-HILL PLANT of Gifford-Hill and Co., Inc., at Forest Hill, La., stripping is done by use of drag-lines which load to trucks. These trucks haul away the stripping and permanently dispose of it.

To maintain a road for the trucks the company uses a Fordson tractor which from time to time pulls a road scraper over the road.

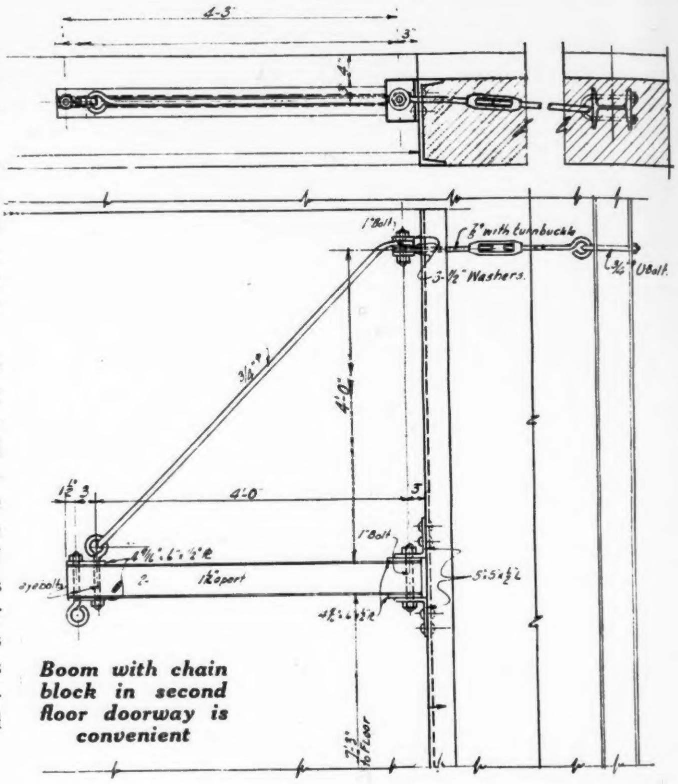
Where trucks are used for stripping haulage it is economical to have a good road. The plant tractor ordinarily may be standing a lot of the time, but it is one of the handiest things that any operator can have around. This use for a tractor is only one of a multitude that any gravel pit could find.

Tractor with road scraper keeps gravel pit roads in shape

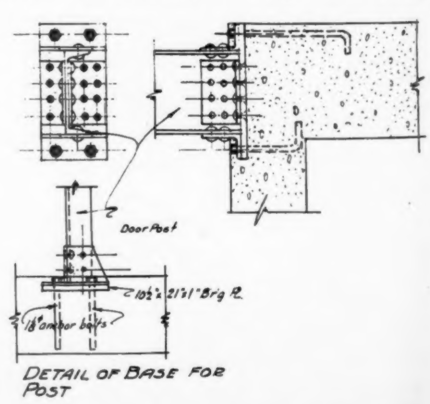
Swinging Boom

By P. F. Rogers
Brooklyn, N. Y.

THE ACCOMPANYING SKETCH shows the details of a very interesting and useful swinging boom which is easy to make and can be used in many places. The one shown is made from 5- and 13-in. angles but this of course can be varied, depending upon the load to be carried or the material available. This one is installed in a second floor doorway and a half-ton chain block is used with it to load or unload direct from the truck, thus saving a considerable distance for travel of the truck around to the unloading platform and subsequent handling with a hand truck and elevator. The jib will swing around practically 180 deg. A similar one is being built in our machine shop to handle castings off and on electric trucks.



Boom with chain block in second floor doorway is convenient



A secure anchor for post is important

Reducing Segregation in Loading Aggregates

AT the Brookhaven Gravel Co.'s plant at Brookhaven, Miss., elimination of segregation while loading is provided for by causing the gondola to shuttle back and forth in

Endless cable keeps cars moving

front of the loading chute. A 15-hp. Westinghouse motor connected to an American Hoist and Derrick Co. winch is the motive power. A ⅞-in. endless cable is given about 5 wraps around a horizontal drum, as shown in the illustration, which is about 4 ft. in length. The cable passes through pulleys at each end of the loading track and to the cable is clipped a short length of chain. The chain is then hooked on to the car being loaded. The operator simply reverses the direction of the motor when he wants to reverse the direction of the car which is being loaded. The device has sufficient power to handle two cars if desired.

Another Use for a Drag Scraper

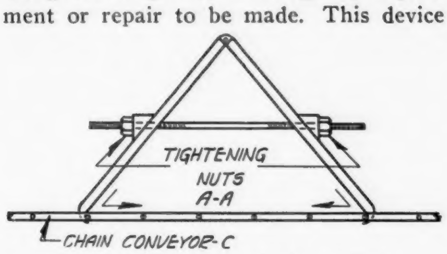
AT THE NEW PLANT of the Coon River Cooperative Sand Association near Des Moines, Ia., a 12-in. Amsco suction dredge is used; but before the hull could be floated a pond had to be made. A P. & H. dragline did most of the digging with this unit piling the material on the bank where a 1-yd. Sauerman "Crescent" drag scraper carried the material off to one side, so that a pit sufficiently large could be dug without the necessity of back casting. The drag scraper not only did this economically but was able to pile the material at a much greater height than would have been possible with the other type of equipment.

Digging pond to float dredge

Helpful Device in Repairing Chain Conveyor

By W. E. Warner
Herts, England

A USEFUL DEVICE when making repairs or adjustments to chain conveyors is shown in the accompanying illustration. The device consists of two legs hooked at one end to grip the chain rivets and jointed at the other as shown. The two legs can be drawn together by means of the tightening screw and nuts, *A A*. When the nuts *A A* are tightened all tension will be taken off the links along the length *C*, enabling any adjustment or repair to be made. This device



Jack holds chain during repair

can be made by any millwright from material readily available.

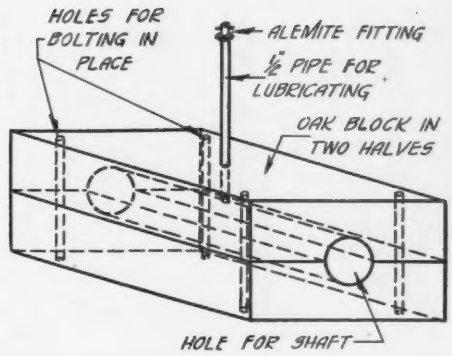
This can be used with either chain or bucket type conveyors, and will enable links or buckets to be removed or replaced without taking the chain off the sprockets.

Wooden Bearings for Sand Drag

WHERE the lower shaft of a drag flight conveyor is down in the water and sand, ordinary metal bearings wear out rapidly, sometimes in a week's time.

This difficulty was overcome at the plant of the Ontario Sand and Gravel Co., Oaks Corners, N. Y., by substituting wooden bearings which require changing only three times in a season.

Such bearings are made from a block of seasoned oak by first boring a hole of the correct size to fit the shaft and then sawing the block in two lengthwise to form two halves. Holes are bored for bolting the halves in place and an additional hole is made



A bearing for sand and water service

in the center of the top half for a ½-in. pipe for lubricating. This pipe is calked tightly into the block and extends up to a convenient point where an Alemite fitting is attached for grease lubrication.

Saving Wear on Vibrating Screens

A SIMPLE EXPEDIENT to prevent wear on the screen surface of vibrating screens in gravel and rock crushing plants is the bolting of a flat metal plate on the screen at the exact point where the feeder chute discharges on to the screen. This plate receives the greater part of the wear and must be replaced from time to time, but this operation can be done quickly and inexpensively, as compared with changing the whole screen surface. The plate cuts down the effective screening area of the screen somewhat, but not enough to materially decrease its efficiency.

Small plate at discharge saves screen

Rock Products Clinic

Storage and Drainage of Lime Putty

A CORRESPONDENT in a western city presents the following problem:

"The work on which I am engaged is working over a plant that was built in this city by a patented lime mortar company about 7 years ago, which was later sold to an organization, made up largely of local building material dealers, now operating it.

"The plant was not well designed, and it has come to a point where repairs are a burden, so that it will be moved to a new and more economical location and numerous changes made in methods at least.

"What I am especially interested in are the bins or silos for mortar putty. The present and original ones are concrete about 7 ft. deep and wide by 25 ft. long, the top level with the ground, which made it necessary to use a pit below that level in order to get the pump to work, as a suction pump will not operate on this material. Of greater importance, however, it has been found that the dewatering process does not go on well with concrete bins, and we are trying to get some information which might have a bearing on this trouble.

"The manager of the plant, who has operated it almost from the start, is very positive regarding this as a cause of trouble, but is unable to discover why it is so. They have tried out lining these bins with wood, but this is an inconsistent arangement, and it has been decided that there is one advantage of an all-wood bin or silo, which has free evaporation from all sides. Drainage would seem to be out of the question, although it might be possible to pump off the top water and use this over again in a lime slaker without loss or waste.

"The company is getting a large share of the local business on a quality basis and is not taking any chances on cutting down in this respect."

* * * * *

Editor's Answer

At different times articles have been published in ROCK PRODUCTS describing putty and mortar plants, but none of these has been very recent as there do not seem to have been any new developments in the process in a number of years.

Difficulty in obtaining a good lime putty by slaking lime in concrete tanks or silos has been experienced by others and is undoubtedly due to the inability of the putty to rid itself of the excess water.

This problem has been satisfactorily solved at one mixed mortar and putty plant in another western city by providing a false bottom for the tank, made of wooden planks and allowing the water rejected in the slaking of the putty to flow away beneath this plank floor.

It seems to be a well established fact in the manufacture of lime putty (and undoubtedly it is one of the reasons why aged lime putty is superior to others) that when the slaking is done, as it commonly is, in a wooden receptacle, the excess water is readily gotten rid of, on standing or ageing, and just the correct amount for the proper slaking of the lime is retained.

Contributions Welcome!

LET us again remind our readers that this page is specifically designed for them to express their views and present their problems. Let us also remind our readers that we seek their help in solving the problems presented. Our shortcomings are as obvious to us as to you.—The Editors.

City Government Competition

THE EDITOR: We have been reading, with much interest, in ROCK PRODUCTS, of plans for several cities to open their own stone quarries and also of those retiring from their present operations.

We notice, on page 87 in your issue of November 8, 1929, that the city of Louisville, Ky., discussed a plan for opening a quarry, but later dropped the matter. We are very much interested in knowing why it was dropped; on page 82 of April 26, 1929, we notice that the city of Poughkeepsie, N. Y., retired from the crushing business and we suppose there was an important reason. We would also like to know the results of the protest made by gravel and stone men on convict competition, noted in the issue of April 26, 1929, page 64.

Our reason for inquiring into these different cases is that we are having trouble in a case similar to those just mentioned.

We operate a crushing plant at Stephens City, Va., and are losing practically all our business because the city of Winchester, Va., which is seven miles away, is operating its own quarry. They have been using convict labor, which makes it impossible for us to compete. They furnished stone on a state contract which was built by a private construction company, and by their statement in the newspaper allege the city made a handsome profit. They were also awarded a contract to furnish the state with stone to surface the above contract.

Examining matters more closely, we find that they are selling to private individuals who, in the past, have been our customers, both in the city and rural districts, and are making a bountiful profit. Our disadvantage is that we have a hauling charge of seven miles to add to our plant price.

Our main advantage over the city in the past has been that we quote a delivered price and their price was strictly at the plant. Recently they disturbed this by quoting a delivered price, hauling in their own trucks and hiring some. It seems to us that this puts the city in the trucking business also. Their bids to the state have been delivered prices.

It is our object to give you a full account of our situation as we see it, in hopes that you have cases similar to ours which have received relief; and if so would appreciate any information concerning these so that we can use it to help ourselves.

CHAS. A. CROSS,
Superintendent, M. J. Grove Lime Co.
Stephens City, Va.

* * * * *

Editor's Reply

Your case of competition with the municipal crushing plant at Winchester, Va., as outlined in your letter, is certainly the most flagrant example of unfair competition by government that has come to our attention in a long time.

We do not know how to advise you specifically as to how to go about correcting the situation other than to suggest that every effort should be made to obtain the actual costs to the city of Winchester, which should be available from the public records and open to inspection by any citizen. We have no doubt that in this case, as in every other case we have known about where city, county or state has competed with a private producer, the real costs are above the selling price, and the alleged profit is possible only by the omission of items which the commercial producer is compelled to include in his costs. One of these, of course, is taxes, another, compensation insurance, and so on.

There has been a great deal of this kind of competition in times past, and sometimes it is maintained for a long time for political reasons, but in every instance that we know of where the facts have been ascertained and properly presented to the tax-paying public, the municipal enterprise has died.

It might be well to employ a special investigator to get at all the facts in the case, and we see no reason why other crushed stone producers in Virginia should not be sufficiently interested to assist.

It is also possible that the secretary of the National Crushed Stone Association could be of definite assistance in this case, as the association undoubtedly has met with similar instances of government competition, and it may have had experience in dealing with them.

If any reader has been successful in showing up and eliminating such competition, the editor would be glad to hear from him, and to publish the details, even though names and localities are omitted, for politic or other reasons.

Editorial Comment

The Opportunity of the Trade Association

Even publishers of business papers—that is live ones such as we concede ROCK PRODUCTS to be—belong to and support a trade association of their industry. This particular association, The Associated Business Papers, Inc., has an auxiliary known as the National Conference of Business Paper Editors, of which the editor of ROCK PRODUCTS is, incidentally, a member. We mention this here, because of all industries, publishing a business paper is as individualistic an enterprise as any we have knowledge of, or as we can even conceive of. Likewise editors belong to as individualistic a profession as any known. Surely then, when such business men accept cooperation as desirable and necessary to present-day conditions there can be little excuse left for producers of basic commodities like rock products, who have far more in common, to remain outside their national trade associations because of their individualistic faith or doctrine.

A committee of business paper editors, each an expert in his particular field or industry, has labored hard for many a day to help solve the present economic riddle, not only to be more useful in the particular industry each paper serves, but to help the general cause through the powerful influence of concerted effort along specific constructive lines. This committee has tentatively adopted a number of general propositions covering the problems of labor and employment, finance, trade policies, management, revision of the anti-trust laws, trade associations, etc. Full publicity will soon be given to these propositions by the Associated Business Papers; and each and every editor we presume will use them as texts for his own editorial comment and development.

One of these propositions we want to lose no opportunity to develop right here, because some of the annual meetings of the trade associations in the rock products industry are close at hand. These business papers editors, as an organized group, believe that: "Trade associations should enlarge their activities to a point where they can function as planning boards for their respective industries. In America we believe in individualism, but to ensure this status we must spur cooperative action, particularly in broad industrial planning, and through research on which such planning must be premised."

Needless to say ROCK PRODUCTS whole-heartedly subscribes to that proposition in its entirety. We know, as every thinking business man knows, that individualism in business is most commonly another name for selfishness—often plain pure greed. We are not so idealistic or lacking in knowledge of human nature as to believe we shall ever have business without selfishness and greed, nor are we convinced that any substitute will be found for individual self-interest as a spur to business enterprise. All that can be reasonably hoped for in the next few generations at least is the general acceptance of a more enlightened interpretation of individual self-interest.

Thomas F. Woodlock, an editorial writer in the *Wall Street Journal,* has explained our present line of thought better than we could do it:

> It would not be unfair to characterize the most recent developments in business thinking as a partial rediscovery of a truth which, for a large part of the civilized world has long been lost, because in fact definitely and dogmatically denied by that part. That truth is that economics is nothing but a branch of ethics. We are commencing to find out by uncomfortable experience that what is bad ethics is also bad economics.
>
> It remains only to experience the contrary, that good ethics makes good economics. We have at last realized that "cut-throat competition and promiscuous wage slashing" (to borrow Secretary Doak's phrase) are bad business, and this is no more and no less than recognition of the principle of the "just price" and the "fair wage."
>
> * * * * * * *
>
> Capitalism rests upon property. Property is necessary in the present scheme of things, with human nature as we know it to be. That all families should possess at least some property, and that all human beings should be able to live at least a decent "human" life is a proposition which on its face commends itself as desirable to all who are not out-and-out Communists. There is nothing inherent in the Capitalistic system which is incompatible with such a condition. It is merely a case of handling the system with this condition as the goal. A "right use of property"—merely that. But here our student enters a mild *caveat*. "Yes, but that 'merely' is not quite so 'mere' as it perhaps appears, for to secure the 'right use of property' you must get rid of avarice as the ruling passion in the hearts of men."
>
> And there's the rub; we might have known there was a "catch" in it! We have to deal with something that no statute law can of itself control or modify by external action, and no "solution" of the problem can be reached by that road. If we abolish Capitalism we abolish property and come at once into flat conflict with human nature; if we do not abolish Capitalism the ingenuity of human avarice will always find means to circumvent the laws that are aimed at curbing its manifestations. There is no short road to the goal; the only road that there is is the road of ethics which has to be traveled on foot, one at a time, by human beings in Indian file. That some in high places have at least started on the journey is a heartening thing.

Now, to us it seems obvious that about the only way in which real progress can be made toward "better business" is through mutually stimulating and inspiring man-to-man contacts in trade associations. The road to be traveled on foot in single file requires leaders or pathfinders. Each industry must produce its own. The national trade association should furnish the fertile soil and the favorable environment for the development of these leaders and pathfinders. For these associations exert through their annual or semi-annual meetings a broadening, civilizing influence that no business man who hopes to keep up with the procession can possibly afford to miss—even though he has to borrow the money to attend.

Financial News and Comment

RECENT QUOTATIONS ON SECURITIES IN ROCK PRODUCTS CORPORATIONS

Stock	Date	Bid	Asked	Dividend
Allentown P. C. 1st 6's[27]	11- 4-31	80	90	
Alpha P. C. new com.[2]	11- 2-31	10	11	25c qu. Oct. 24
Alpha P. C. pfd.[2]	11- 2-31	95	110	1.75 qu. Sept. 15
Amalgamated Phosphate Co. 6's, 1936[19]	10-30-31	95	100	
American Aggregates com.[19]	10-30-31	2	4	75c qu. Mar. 1
American Aggregates pfd.[19]	10-30-31	30	40	1.75 qu. Oct. 1
Amer. Aggr. 6's, w.w.[19]	10-30-31	43	50	
Amer. Aggr. 6's, ex-w.[19]	10-30-31	41	49	
Amer. L. & S. 1st 7's[27]	11- 4-31	92	96	
American Silica Corp. 6½'s[39]	11- 4-31	No market		
Arundel Corp. new com.	11- 2-31	28	28½	75c qu. Oct. 1
Bessemer L. & C. Class A[4]	10-30-31	....	15	50c qu. Aug. 1
Bessemer L. & C. 1st 6½'s[4]	10-30-31	....	60	
Bloomington Limestone 6's[27]	11- 4-31	20	25	
Boston S. & G. new com.[37]	10-30-31	5	8	15c qu. Oct. 1
Boston S. & G. new 7% pfd.[37]	10-30-31	32	37½	87½c qu. Oct. 1
California Art Tile, A	10-30-31	....	5¼	43¾c Mar. 31
California Art Tile, B[40]	10-29-31	....	3	20c qu. Mar. 31
Calaveras Cement com.[9]	10-29-31	....	10	
Calaveras Cement 7% pfd.	10-30-31	....	75	1.75 qu. Oct. 15
Canada Cement com.	11- 3-31	7⅝	8	
Canada Cement pfd.	11- 3-31	68½	69	1.62½ qu. Sept. 30
Canada Cement 5½'s[42]	10-30-31	85	90	
Canada Crushed Stone bonds[42]	10-30-31	78	88	
Canada Crushed Stone com.[42]	10-30-31	5	....	
Canada Crushed Stone pfd.[41]	10-27-31	....	75	
Certainteed Products com.	11- 2-31	3¼	3½	
Certainteed Products pfd.	11- 2-31	22	26	1.75 qu. Jan. 1
Cleveland Quarries	11- 2-31	....	50	25c qu. Dec. 1
Columbia S. & G. pfd.	11- 2-31	89	91	
Consol. Cement 1st 6½'s, A[44]	11- 4-31	No market		
Consol. Cement notes, 1941[27]	11- 4-31	No market		
Consol. Cement pfd.[27]	11- 4-31	....	60	
Consolidated Oka Sand and Gravel (Canada) 6½'s[12]	10-30-31	97	99	
Consolidated Oka Sand and Gravel (Canada) com.[41]	10-27-31	....	7	
Consolidated Oka Sand and Gravel (Canada) pfd.[41]	10-27-31	....	76	1.75 qu. Oct. 10
Consol. Rock Prod. com.[9]	10-29-31	25c	35c	
Consol. Rock Prod. pfd.[9]	10-29-31	2	2½	43¾c qu.June1,'30
Consol. Rock Prod. units	10-31-31	3	5	
Consol. S & G. pfd. (Can.)	10-19-31	70	....	1.75 qu. Nov. 16
Construction Mat. com.	11- 3-31	1⅛	3	
Construction Mat. pfd.	11- 3-31	4½	11½	87½c qu. Aug. 1
Consumers Rock and Gravel, 1st Mtg. 6's, 1948[18]	10-29-31	47	52	
Coosa P. C. 1st 6's[23]	11- 3-31	40	....	
Coplay Cem. Mfg. 1st 6's[19]	10-30-31	50	60	
Coplay Cem. Mfg. com.[33]	10-30-31	5	7½	
Coplay Cem. Mfg. pfd.[33]	10-30-31	25	40	
Dolese and Shepard	11- 3-31	24	26	$1 qu. Oct. 1
Dufferin Pav. & Cr. Stone pfd.[42]	10-30-31	....	68	1.75 qu. Oct. 1
Dufferin Pav. & Cr. Stone com.[42]	10-30-31	6	....	
Edison P. C. com.[32]	10-30-31	1½	....	
Edison P. C. pfd.[32]	10-30-31	5	....	
Federal P. C. 6½'s, 1941[19]	10-30-31	....	95	
Giant P. C. com.[2]	11- 2-31	2	5	
Giant P. C. pfd.[2]	11- 2-31	10	15	1.75 s.-a. Dec. 15
Gyp. Lime & Alabastine, Ltd.	11- 3-31	5¾	6	10c qu. Oct. 5
Gyp. Lime & Alabastine 5½'s.	10-27-31	75	82	
Hermitage Cement com.[11]	10-31-31	15	20	
Hermitage Cement pfd.[11]	10-31-31	65	70	
Ideal Cement, new com.[29]	10-31-31	24	26	50c qu. & 50c ex. Oct. 1
Ideal Cement 5's, 1943[20]	10-31-31	98	100	
Illinois Electric Limestone 1st 7's[38]	9-18-31	....	90	
Indiana Limestone units[27]	11- 4-31	No market		
Indiana Limestone 6's	10-30-31	16 actual sale		
International Cem. com.	11- 2-31	22½	22¾	$1 qu. Sept. 30
International Cem. bonds, 5's.	11- 2-31	72½ act. sale		Semi-ann. int.
Iron City Sand & Gravel 6's, 1940[36]	10-31-31	....	70	
Kelley Is. L. & T. new stock	11- 2-31	18	19½	50c qu. Oct. 1
Ky. Cons. Stone com.	11- 2-31	....	4	
Ky. Cons. Stone pfd.	11- 2-31	....	77½	1.75 qu. May 1
Ky. Cons. St. 1st Mtg. 6½'s[38]	11- 4-31	....	70	
Ky. Cons. Stone V. T. C.[38]	11- 4-31	....	2	
Ky. Rock Asphalt com.	11- 2-31	3½	4¼	40c qu. Oct. 1, '30
Ky. Rock Asphalt pfd.	11- 2-31	....	60	1.75 qu. Sept. 1
Ky. Rock Asphalt war.[45]	11- 2-31	1	2	
Ky. Rock Asphalt 6½'s	11- 2-31	84½	88	
Lawrence P. C.	11- 2-31	18	23	$1 qu. June 30
Lawrence P. C. 5½'s, 1942[2]	11- 2-31	45	52	
Lehigh P. C. com.	11- 2-31	6¼	7	25c qu. May 1
Lehigh P. C. pfd.	11- 2-31	82	84	1.75 qu. Oct. 1
Louisville Cement[7]	10-29-31	100	150	
Lyman-Richey 1st 6's, 1932[13]	10-30-31	93	....	
Lyman-Richey 1st 6's, 1935[13]	10-30-31	90	....	
MarbleheadLime 6's[14]	10-30-31	No market		
Marbelite Corp. com. (cement products)	10-30-31	....	1	
Marbelite Corp. pfd.	10-30-31	1	....	50c qu. Oct. 10, '30
Material Service Corp.	11- 3-31	15¾	17	50c qu. June 1
McCrady-Rodgers 7% pfd.[22]	10-29-31	38	....	87½c qu. Sept. 30
McCrady-Rodgers com.[22]	10-29-31	10	15	75c qu. Jan. 26
Medusa Portland Cement	11- 2-31	....	30	75c qu. Apr. 1
Michigan L. & C. com.[6]	10-31-31	45	....	
Missouri P. C.	11- 3-31	....	17	25c qu. Oct. 31
Monolith Portland Midwest com.[9]	10-29-31	75c	1	
Monolith P. C. com.[9]	10-29-31	1½	2	40c s.-a. Jan. 1
Monolith P. C. pfd.[9]	10-29-31	3½	4	40c s.-a. Jan. 1
Monolith P. C. units[9]	10-29-31	8½	10	
Monolith P. C. 1st Mtg. 6's[9]	10-29-31	65	70	
National Cem. (Can.) 1st 7's[27]	11- 4-31	74	....	
National Gypsum A com.[27]	11- 4-31	1½	2½	
National Gypsum pfd.[27]	11- 4-31	37	40	1.75 Oct. 1
Nazareth Cement com.[25]	9-19-31	....	10	
Nazareth Cement pfd.[25]	9-19-31	....	85	
Newaygo P. C. 1st 6½'s[27]	11- 4-31	73	78	
New England Lime 6's, 1935[19]	10-30-31	....	50	
N. Y. Trap Rock 1st 6's	10-31-31	81½	82½	
N. Y. Trap Rock 7% pfd.[30]	10-19-31	....	85	1.75 qu. July 1
North Amer. Cem. 1st 6½'s	10-31-31	25¾ actual sale		
North Amer. Cem. com.[27]	11- 4-31	50c	2½	
North Amer. Cem. 7% pfd.[27]	11- 4-31	4	7	
North Shore Mat. 1st 5's[15]	11- 4-31	80	....	
Northwestern States P. C.[31]	10-31-31	....	75	$2 Apr. 1
Ohio River S. & G. com.	11- 2-31	....	8	
Ohio River S. & G. 7% pfd.	11- 2-31	....	98	
Ohio River S. & G. 6's[16]	10-30-31	....	80	
Oregon P. C. com.[9]	10-29-31	8	12	
Oregon P. C. pfd.[9]	10-29-31	80	85	
Pacific Coast Aggr. com.[40]	10-29-31	....	1	
Pacific Coast Aggr. pfd.[40]	10-29-31	....	1½	
Pacific Coast Cement 6's[5]	10-30-31	76	....	
Pacific P. C. com.	10-30-31	....	12	
Pacific P. C. pfd.	10-30-31	49	55	1.62½ qu. Oct. 5
Pacific P. C. 6's[5]	10-30-31	90	....	
Peerless Cement com.[21]	10-31-31	1	2	
Peerless Cement pfd.[21]	10-31-31	....	38	1.75 qu. Apr. 1
Penn.-Dixie Cement com.	11- 2-31	1½	1⅝	
Penn.-Dixie Cement pfd.	11- 2-31	6½	9	
Penn.-Dixie Cement 6's	11- 2-31	40⅞	41	
Penn. Glass Sand Corp. 6's	10- 7-31	98	100	
Petoskey P. C.	11- 3-31	3	3¾	15c qu. Apr. 1
Port Stockton Cem. com.[9]	10-29-31	No market		
Riverside Cement com.	10-30-31	....	9	
Riverside Cement pfd.[5]	10-30-31	52	56	1.50 qu. Nov. 1
Riverside Cement, A	10-30-31	....	15	15c qu. Feb. 1
Riverside Cement, B[9]	10-29-31	70c	1	
Roquemore Gravel 6½'s,[17]	10-30-31	98	100	
Sandusky Cement 6½'s, 1931-37[19]	10-30-31	80	90	
Santa Cruz P. C. com.[5]	10-30-31	76	....	$1 qu. Oct. 1
Schumacher Wallboard com.	10-30-31	....	6½	25c qu. June 27
Schumacher Wallboard pfd.	10-30-31	....	20	50c qu. Nov. 15
Southwestern P. C. units[35]	10-30-31	225	250	
Standard Paving & Mat. (Canada) com.[42]	10-30-31	4	....	50c qu. May 15
Standard Paving & Mat. pfd.[42]	10-30-31	60	....	1.75 qu. Nov. 16
Superior P. C., A	10-30-31	33	33¼	27½c mo. Dec. 1
Superior P. C., B	10-30-31	7⅝	10	25c qu. Mar. 20
Trinity P. C. units[31]	10-31-31	90	95	
Trinity P. C. com.[31]	10-31-31	14	....	
U. S. Gypsum com.	11- 2-31	27	27½	40c qu. Sept. 30
U. S. Gypsum pfd.	11- 2-31	118	120	1.75 qu. Sept. 30
Wabash P. C.[21]	11- 2-31	....	21	
Warner Co. com.[16]	10-30-31	7	9	25c qu. Oct. 15
Warner Co. 1st 7% pfd.[16]	10-30-31	....	85	1.75 qu. Oct. 1
Warner Co. 1st 6's 1941	11- 4-31	52 act. sale		
Whitehall Cem. Mfg. com.[30]	11- 4-31	60	....	
Whitehall Cem. Mfg. pfd.[30]	11- 4-31	40	....	
Wisconsin L. & C. 1st 6's[15]	11- 4-31	80	....	
Wolverine P. C. com.	11- 3-31	1½	4	15c qu. Nov. 15
Yosemite P. C., A com.[9]	10-29-31	1	1½	

Quotations by: [1]Watling Lerchen & Hayes Co., Detroit, Mich. [2]Bristol & Willett, New York. [3]Rogers, Tracy Co., Chicago. [4]Butler, Beadling & Co., Youngstown, Ohio. [5]Smith, Camp & Riley, San Francisco, Calif. [6]Frederick H. Hatch & Co., New York. [7]J. J. B. Hilliard & Son, Louisville, Ky. [8]Dillon, Read & Co., Chicago, Ill. [9]A. E. White Co., San Francisco, Calif. [10]Lee Higginson & Co., Boston and Chicago. [11]J. W. Jakes & Co., Nashville, Tenn. [12]James Richardson & Sons, Ltd., Winnipeg, Man. [13]Stern Bros. & Co., Kansas City, Mo. [14]First Wisconsin Co., Milwaukee, Wis. [15]Central-Republic Bank & Trust Co., Chicago. [16]J. S. Wilson, Jr., Baltimore, Md. [17]Citizens Southern Co., Savannah, Ga. [18]Dean, Witter & Co., Los Angeles, Calif. [19]Hewitt, Ladin & Co., New York. [20]Tucker, Hunter, Dulin & Co., San Francisco, Calif. [21]Baker, Simonds & Co., Inc., Detroit, Mich. [22]Peoples-Pittsburgh Trust Co., Pittsburgh, Penn. [23]Howard R. Taylor & Co., Baltimore. [24]Richards & Co., Philadelphia, Penn. [25]Hincks Bros. & Co., Bridgeport, Conn. [26]Bank of Republic, Chicago, Ill. [27]National City Co., Chicago, Ill. [28]Chicago Trust Co., Chicago, Ill. [29]Boettcher-Newton & Co., Denver. [30]Hanson and Hanson, New York. [31]S. F. Holzinger & Co., Milwaukee, Wis. [32]Tobey and Kirk, New York. [33]Steiner, Rouse and Co., New York. [34]Jones, Heward & Co., Montreal, Que. [35]Tenney, Williams & Co., Los Angeles, Calif. [36]Stein Bros. & Boyce, Baltimore, Md. [37]Wise, Hobbs & Arnold, Boston. [38]E. W. Hays & Co., Louisville, Ky. [39]Blythe Witter & Co., Chicago, Ill. [40]Martin Judge Co., San Francisco, Calif. [41]A. J. Pattison Jr. & Co. Ltd., Toronto, Canada. [42]Nesbitt, Thomson & Co., Montreal. [44]E. H. Rollins, Chicago. [45]Dunlap, Wakefield & Co., Louisville, Ky. [46]Dan Powell & Co., Los Angeles.

Bessemer Cement Passes Common Dividend

THE Bessemer Limestone and Cement Co., Youngstown, Ohio, has passed the quarterly dividend of 50 cents on class "A" shares due November 1. President L. A. Beeghly is quoted as follows:

"The general business conditions have been reflected in the cement business by a decided drop in the quantity of cement consumed, and by radical price reductions which have resulted in the elimination of all profits.

"For these reasons, and to conserve the resources of the company, it was deemed inadvisable to pay the dividend due November 1, 1931, on the class 'A' stock. These dividends are cumulative and will be paid when conditions warrant such action."

Penn.-Dixie Cement Statement for Year Ending September 30

THE PENNSYLVANIA-DIXIE CEMENT CORP. and subsidiaries report for 12 months ended September 30, 1931, profit of $895,392 before depreciation, depletion, federal taxes and interest. After providing for interest and federal taxes, profit before depreciation and depletion was $238,737, and net loss after depreciation and depletion amounted to $1,149,688. This compares with net profit in the preceding 12 months of $417,192, equal to $3.07 a share on 135,888 shares of 7% preferred stock.

Cash and short-term securities amounting to $3,155,842 are greater than a year ago and more than eight times current liabilities.

Consolidated income account for 12 months ended September 30, 1931, compared with 1930 and 1929 is given below.

Consolidated balance sheet of Pennsylvania-Dixie Cement Corp. as of September 30, 1931, follows:

CONSOLIDATED INCOME STATEMENT OF PENNSYLVANIA-DIXIE CEMENT CORP.

	1931	1930	1929
Operating profit	$ 895,392	$2,552,762	$2,930,414
Depreciation and depletion	1,388,425	1,386,517	1,397,257
Loss	$ 493,033	*$1,166,245	*$1,533,157
Interest	637,209	681,369	710,980
Federal taxes	19,446	67,684	136,105
Net loss	$1,149,688	†$417,192	†$686,072

*Profit. †Net profit.

CONSOLIDATED BALANCE SHEET—ASSETS

	1931	1930	1929
*Land, buildings, equipment, etc.	$23,345,854	$24,601.339	$25,480.849
Cash	2,785,842	2,813,902	2,332,997
Notes and accounts receivable	734,024	1,065,113	1,419,154
Inventories	2,337,889	2,699,586	2,710,614
Short-term securities	370,000	....	....
Miscellaneous investments	340,721	402,918	84,100
Assets with trustee	510	....	....
Insurance fund and employes' stock	195,261	158,950	35,000
Deferred charges	23,087	11,818	85,959
Total	$30,133,188	$31,753,626	$32,148,673

LIABILITIES

	1931	1930	1929
Preferred stock	$13,588,800	$13,588.800	$13,588,800
†Common stock	4,000,000	4,000,000	4,000.000
Gold bonds	10,281,000	10,929,000	11,789,000
Accounts payable	160.442	205,242	166,756
Accrued taxes, interest, etc.	148,018	185,304	214,845
Federal tax reserve	48,898	165,586	164.459
Miscellaneous reserves	376,936	249,588	205,637
Surplus	1,529,094	2,430,106	2,019,176
Total	$30,133,188	$31,753,626	$32,148,673

*After depreciation and depletion. †Represented by 400,000 no-par shares.

Current assets	$6,227,755	$6,578,601
Current liabilities	357,358	556,132
Working capital	$5,870,397	$6,022,469

Annual Report of Kentucky Consolidated Stone Co.

OPERATIONS of the company during the fiscal year ending April 30, 1931, reflect the general tendency of all industries toward reduction in volume of sales.

Stone production during this year was 809,321.97 tons as compared to 1,210,484.17 tons for the previous year, a shrinkage of 33.1%. Average sale price of the output was 2.24c. per ton lower than that for the previous year.

During this year bonded indebtedness was reduced by $114,500 and $34,900 of preferred stock was retired. Since organization a total of $225,000 of the bonds and $82,700 of preferred stock has been retired.

Since the opening of the new year, beginning May 1, 1931, it has become evident that there will be a further shrinkage in volume for the year ending April 30, 1932, accompanied with reduction in sales price to meet the severe competition. This has been brought about by greatly reduced purchasing by railroads and others.

Under such conditions, the course of wisdom is to conserve every resource of the company over this year and to operate under a system of the most rigid economy, looking forward to the next year, which will almost necessarily be one of greatly increased stone consumption. To this end, the operating personnel of the company has been reduced to the emergency minimum and every possible expense eliminated. Notwithstanding the rigid economy that has been made effective and the material reduction in many cost items which will be permanent, the plants have been maintained in excellent condition and hence with the revival of the stone business which will necessarily take place in bringing up the condition of railroads and highways, these economies will reflect in increased earnings.

With this policy of strictest economy of operation, operating capital will be conserved so that the company will be in position to maintain its high credit and take advantage of the revival of business.

Due to the condition described and the necessity of conserving the funds of the corporation, it was the decision of the board of directors that the dividend, payable on the preferred stock on August 1, 1931, be passed.

ASSETS

Cash, accounts receivable, and inventories	$ 152,510.22
Sinking funds	3,653.50
Stone deposits, plants and equipment	5,069,666.12
Deferred and other assets	180,755.86
	$5,406,585.70

LIABILITIES

Accounts payable	$ 81,911.40
First mortgage 6½% gold bonds	775,000.00
Reserves for depreciation and depletion	515,639.86
Reserves for legal and professional	3,000.00
Capital stock—7% preferred	517,300.00
Surplus by appraisal	3,331,312.52
Undivided profit	182,421.92
	$5,406,585.70

UNDIVIDED PROFIT ACCOUNT

Undivided profit, April 30, 1930	....	$204,315.93
Profit for year ending April 30, 1931	$29,201.43	....
Over-accrual income tax prior year	119.56	29,320.99
		$233,636.92
Reserves for other assets, etc.	$14,500.00	....
Dividends on 7% preferred stock	36,715.00	51,215.00
		$182,421.92

Alpha Cement Statement for Year Ended September 30

THE REPORT of Alpha Portland Cement Co., Easton, Penn., for 12 months ended September 30, 1931, shows net loss of $382,975 after depreciation, federal taxes, etc. This compares with net income of $1,280,017, equal after 7% preferred dividends, to $1.60 a share on 711,000 no-par common shares in 12 months ended September 30, 1930.

Consolidated income account for 12 months ended September 30, 1931, compares as follows:

	1931	1930	1929
Net sales	$6,610,293	$10,294,030	$12,373,664
Operating expenses	5,732,968	7,706,667	9,132.009
Depreciationn	1,393,521	1,383.594	1,266,721
Operating loss	$ 516,196	*$1,203,769	*$1,974,934
Other income (net)	160,976	228,372	288,815
Loss	$ 355.220	†$1,432.141	†$2,263.749
Federal taxes	27,755	152,124	274,704
Net loss	$ 382,975	*$1,280,017	*$1,989,345
Preferred dividends	140,000	140,000	140,000
Common dividends	888,750	1,777,500	2,133,000
Deficit	$1,411,725	$637,483	$283,655

*Profit. †Income.

Surplus account follows: Surplus October 1, 1930, $4,434,296; deduct: Net loss for 12 months ended September 30, 1931, $382,975; preferred dividends, $140,000; common dividends, $888,750; additional depreciation

for year 1928 as adjusted by Treasury Department, $32,367; provision for additional federal taxes for prior years, $200,000; adjustment of sack inventory to market value at December 31, 1930, $95,658; surplus, September 31, 1931, $2,694,546.

Consolidated balance sheet of Alpha Portland Cement Co. as of September 30, 1931, compares as follows:

ASSETS	1931	1930	1929
*Property account	$20,085,026	$21,495,585	$22,236,204
Cash	3,544,381	5,696,939	2,938,157
Call loans	....	....	2,600,000
Certificates of deposit	110,000	....	....
U. S. government bonds, etc.	2,954,950	1,357,975	1,357,975
Working funds and advertising	136,246	192,906	155,754
Accounts and notes receivable	969,069	957,331	1,095,466
Inventories	1,876,558	2,236,986	2,485,053
Miscellaneous investments	371,458	273,079	220,967
Deferred ch'ges	154,222	131,405	335,289
Total	$30,201,910	$32,342,206	$33,424,865
LIABILITIES			
Preferred stock	$ 2,000,000	$ 2,000,000	$ 2,000,000
†Common stock	24,134,500	24,134,500	24,134,500
Accounts payable	260,879	324,611	391,203
Wages payable	46,859	71,393	84,954
Federal tax reserve, etc.	112,127	276,820	386,667
Dividends payable	177,750	355,500	533,250
Insurance and other reserves	775,249	745,086	822,513
Earned surplus	2,694,546	4,434,296	5,071,778
Total	$30,201,910	$32,342,206	$33,424,865

*After depreciation, depletion, etc. †Represented by 711,000 no-par shares.

Consolidated Cement Corp. in Voluntary Receivership

FEDERAL JUDGE Richard J. Hopkins, Lawrence, Kan., has appointed Stanley S. D. Stewart and F. W. Story receivers for the Consolidated Cement Corp., Fredonia, Kan., at the request of William D. Pratt, Fredonia, a stockholder.

Mr. Pratt's petition said the corporation, with plants at Fredonia and Mildred, Kan., had lost $400,000 in the last two years. The petition also said the corporation's president, John L. Senior, was responsible for incorrect income and expense reports made to stockholders the past five years, and that he had spent exessively for marketing and for salaries of officers.

Stanley Stewart, of Kansas City, one of the receivers of the corporation, has announced that the head offices of the concern would be located in Fredonia within a few weeks.—*Fredonia* (Kan.) *Herald.*

Recent Dividends Announced

Cleveland Quarries Co. (qu.)	$0.25,	Dec. 1
Consolidated Sand and Gravel pfd. (Canada) qu.	1.75,	Nov. 16
Missouri Portland Cement com. (qu.)	0.25,	Oct. 31
Standard Paving and Materials pfd. (qu.)	1.75,	Nov. 16
Superior Portland Cement, Cl. A. (mo.)	0.27½,	Dec. 1

Indiana Limestone Co. to Have Financial Reorganization

PLANS for reconstruction of the capital structure of the Indiana Limestone Co. consistent with current building conditions have been approved by committees representing the holders of bonds, debentures and stock, as announced by President Dickinson.

As a first step in the reorganization plan, a bill in equity in a friendly action was filed by the Cleveland Trust Co. as trustee in federal court in Indianapolis to foreclose the first mortgage loan.

"The new plan consists of scaling down the outstanding securities in keeping with lower price levels and to meet present day competition in the construction industry," it was announced by Mr. Dickinson.

"The committees have agreed to a moratorium in the payment of interest charges and sinking fund requirements to relieve the corporation of this obligation pending further improvement in the industry, this readjustment saving the company $1,500,000 a year in fixed charges. Holders of securities have indicated cooperation in the plan, and over 50% of the first mortgage bonds have been deposited.

"The company has on its books unfilled orders for cut stone totaling 530 carloads in excess of unfilled orders on May 1 last. Despite this improvement in volume of business, it was deemed advisable to place the financial structure of the company on a basis permitting operation under lessened obligations of its fixed charges." No change is contemplated in the business activities of the company, Mr. Dickinson added.

Missouri Portland Cement Dividend Reduced

DANIEL K. CATLIN, capitalist, has been elected a member of the board of Missouri Portland Cement Co., succeeding to the place vacated by the late J. Sheppard Smith, president of the Mississippi Valley Trust Co. The board also declared a quarterly dividend of 25 cents on the capital stock payable October 31. The company previously disbursed quarterlies of 50 cents each. The dividend, however, is the 123d consecutive quarterly disbursement, as the company has an unbroken record over the past thirty-one years.

It is understood its action in reducing the final quarterly of this year was in line with its usual conservative policy, pending clarification of the general business situation. Its ratio of quick assets to liabilities is eleven to one at present, and book value of the common, its only capital obligation, as of October 1, was $39.39. The company has no indebtedness other than the small current liabilities.—*St. Louis* (Mo.) *Globe Democrat.*

International Cement Third Quarter Earnings

THE INTERNATIONAL CEMENT CORP., New York City, reports for the three quarters of 1931, sales and earnings as follows:

Compared with recent years, the consolidated income account for the quarters ended September 30 is as given below.

INTERNATIONAL CEMENT CORP. STATEMENT

	Third quarter, 1931	Second quarter, 1931	First quarter, 1931
Gross sales	$8,938,636.58	$8,868,624.98	$6,111,424.51
Less: packages, discounts and allowances	2,196,584,30	1,974,100.16	1,178,498.86
Net sales	$6,742,052.28	$6,894,524.82	$4,932,925.65
Manufacturing cost, excluding depreciation	$3,497,894.17	$3,798,274.45	$2,644,879.36
Depreciation	1,004,923.04	835,199.65	467,625.38
	$4,502,817.21	$4,633,474.10	$3,112,504.74
Manufacturing profit	$2,239,235.07	$2,261,050.72	$1,820,420.91
Shipping, selling and administration expenses	1,179,508.27	1,146,403.88	1,055,370.06
Net profit	$1,059,726.80	$1,114,646.84	$ 765,050.85
Less: interest charges and financial expenses	184,624.31	190,086.83	193,135.71
	$ 875,102.49	$ 924,560.01	$ 571,915.14
Reserves for federal taxes and contingencies	343,622.59	334,841.84	161,005.86
Net to surplus	$ 531,479.90	$ 589,718.17	$ 410,909.28

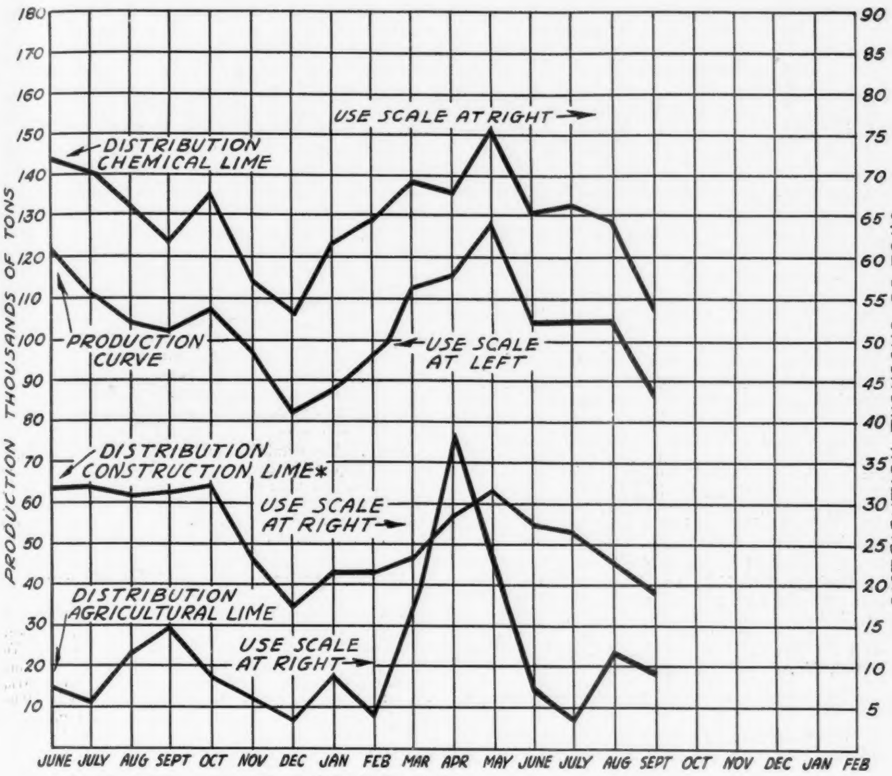
From the foregoing the net to surplus for the nine months is $1,532,107.35. These earnings, after allowing for interest on gold debentures, are equivalent to $2.41 per share on 636,171 shares of common stock outstanding on September 30, 1931.

COMPARATIVE INCOME ACCOUNTS—INTERNATIONAL CEMENT CORP.

	1931	1930	1929	1928
Gross sales	$ 8,938,636	$ 9,638,985	$10,377,104	$10,209,715
Expenses, etc.	6,873,986	6,759,010	7,662,534	7,724,661
Depreciation	1,004,923	880,634	863,371	616,818
Balance	$ 1,059,727	$ 1,999,341	$ 1,851,199	$ 1,868,236
Interest, taxes, etc.	528,247	604,338	490,843	450,320
Net income	$ 531,480	$ 1,395,003	$ 1,360,356	$ 1,417,916

NINE MONTHS ENDED SEPTEMBER 30:

	1931	1930	1929	1928
Gross sales	$23,918,685	$25,930,394	$26,929,929	$25,673,286
Expenses, etc.	18,671,513	18,794,638	20,104,104	19,365,695
Depreciation	2,307,748	2,160,579	1,932,654	1,608,917
Balance	$ 2,939,424	$ 4,975,177	$ 4,893,171	$ 4,698,674
Interest, taxes, etc.	1,407,317	1,528,411	1,365,407	1,084,300
Net income	$ 1,532,107	$ 3,446,766	$ 3,527,764	$ 3,614,374



* DOES NOT INCLUDE FINISHING LIME

Operations of lime industry for 15 months

Lime Statistics

THE ACCOMPANYING CHART shows statistics of operations in the lime industry for a 15-month period ending in September, 1931.

This information, supplied by the National Lime Association, represents only 43% of the total lime production of the country. Reasonable accuracy in estimating total production should be obtained from it by doubling the amounts shown in the chart.

Develop California Asbestos Deposit—To Build Mill

PURCHASE of the Canyon House hotel property, 18 miles east of Santa Rosa, Calif., and the taking over some time ago of a large asbestos deposit adjoining the United States Asbestos Corp., have started a new industry in Napa county.

Plans and specifications have been completed for a mill, to cost $20,000, with a capacity of 100 tons of crude ore a day, officials of the company declared.

L. F. Whitney and two other engineers, who have examined the property, report that the ore runs from 10 to 50% asbestos and there has been developed over 4,000,000 tons of ore of a net operating value of $14,000,000.

Although there are four manufacturing plants making asbestos products in the Bay region, there has been no production of crude asbestos on the Pacific coast. These plants, the engineers say, could take 25 tons of asbestos a day and within six months handle 100 tons a day.—*Santa Rosa* (Calif.) *Press-Democrat.*

Gypsum Production in Canada, August, 1931

DURING the first eight months of the current year gypsum production in Canada totalled 547,403 tons, a 23.2% decline from the total for the corresponding period of 1930, the Dominion Bureau of Statistics reports. August shipments were reported at 123,790 tons as compared with 130,482 tons in July and 140,709 tons in August last year.

Canadian producers exported 99,620 tons of crude gypsum to the United States during August. Plaster of paris exports amounted to 263 tons, made up of 181 tons to New Zealand, 72 tons of Newfoundland, 9 tons to South Africa, and 1 ton to United States.

PRODUCTION OF GYPSUM

August,	1931	123,790 tons
July,	1931	130,482 tons
August,	1930	140,709 tons
Eight months ending:		
August,	1931	547,403 tons
August,	1930	713,021 tons
August,	1929	778,460 tons

Start Lime Products Plant in California

CONSTRUCTION of a new $150,000 plant is under way, according to H. E. Weiss, president, Dry Refrigeration, Inc., Ltd. It will be on the Santa Fe railroad, 19 miles west of San Bernardino, Calif. The new plant is to be operated in conjunction with the present one permitting the manufacture of all kinds of lime products. Stone and Webster, contractors, have already started grading for the foundation work.—*New York* (N. Y.) *Journal of Commerce.*

Sues County Auditor for Refusal to Pay for Gravel

A SUIT, seeking to mandate County Auditor Speidel to pay claims against the county for road gravel, was filed in the Blackford circuit court at Hartford City, Ind., by the S. and L. Gravel Co. of Indiana recently.

Auditor Speidel contends that the board of commissioners entered into a contract with the gravel company, before the money was made available, and for this reason, may be illegal. The suit is to establish this point.

Paragraph one of the complaint sets out that on July 6, 1931, the county was indebted to the S. and L. Gravel Co. $1,328.62 for gravel. The claim was filed five days prior to the regular July meeting of the board, and the commissioners in their July meeting, allowed the claim and authorized a warrant made to the gravel company.

Paragraph two, sets out like conditions, naming June 2 as the date when the county was indebted to the gravel company for $1,684.57. This claim was likewise passed and a warrant ordered by the board, the suit sets out.

Paragraph three is for a claim of $400 and paragraph four is upon a claim of $1,328.63. Each paragraph contends that formal demand was twice made upon the auditor for payment of the claims, but that he refused and still refuses to make payment.

The suit seeks an order from the court to compel the auditor to issue warrants to the gravel company for the gravel, which the suit contends was used on county roads.—*Hartford City* (Ind.) *News.*

Rock Asphalt Plant Adds Equipment—Operates at Capacity

THE Hufty Rock Asphalt Co. has made a number of improvements about its mill and mine at Liberal, Mo., the past month.

The company's product has met with remarkable success. The company has just completed filling the fourth big order received from the United States government.

Improving at the plant includes the installing of a new set of rolls; the building of an automatic batch hopper; an addition to the work platform, doubling the capacity and adding to the unloading convenience; the installing of two 6000-gal. tanks for storage and handling of asphalt; and the installation of an automatic heating system. At the mine compressed air drilling machine, jack hammer and splitter has been installed, making it possible to mine 500 tons of the rock a day.

The first sale of the finished product of the Hufty mill was made in May last year. The sales have constantly increased and are now taxing the capacity of the mill.

Officials of the company state the outlook is even better than they had expected. Recently they have been running night and day to fill the orders.—*Liberal* (Mo.) *News.*

Traffic and Transportation

Proposed Changes in Rates

THE following are the latest proposed changes in freight rates up to the week of October 31:

TRUNK LINE ASSOCIATION DOCKET

27862. **Slag, crude or crushed**, in bulk, carloads (See Note 2), from Sparrows Point, Md., to Falls Church, Va., $1.25 per net ton. Present rate, 21½c per 100 lb. (class A). (See Note 5.)

27865. **Sand**, other than blast, engine, fire, foundry, glass, molding, quartz, silex or silica, and **gravel**, carloads (See Note 2), from Wilmington, Del., and Northeast, Md., to Loretto, Md., $1.40 per net ton. Present rate, $1.85. Reason—Proposed rate comparable with rates from Lewes, Del., and Northeast, Md., to Cambridge, Md.

M-1881. **Marble, crushed, and marble screenings**, in bags or in bulk, straight or mixed carloads, minimum weight 60,000 lb., from Harrisonburg, Va., to Baltimore, Md., $3; Philadelphia, Penn., $3.40; and New York, N. Y., $3.80 per net ton.

27878. **Sand**, carloads (See Note 2), from Menantico, N. J., to Bridgeton, N. J., 70c per net ton. Present rate, 86c. (See Note 4.)

27881. (A) **Sand**, in open-top cars, carloads; (B) **sand**, in box cars or closed equipment, carloads (See Note 2), from Toms River, N. J., to Alexandria, Va., (A) $2.55 and (B) $2.80 per net ton. Present rate, 32c per 100 lb., 6th class. Reason—Proposed rates compare favorably with rates from Vineland, Cape May, N. J., etc.

27888. **Crushed stone**, carloads (See Note 2), from Munns, N. Y., to D. & H. R. R. stations:

To	Prop.
Windsor and East Windsor	$1.45
Centre Village	1.35
Binghamton to Sanitaria Springs	1.40
Tunnel	1.40
Harpursville and Ninevah	1.30
Afton and Bainbridge	1.25
Unadilla and Wells Bridge	1.25
Otego and Oneonta	1.35
Colliers and Schenevus	1.45

Above rates per net ton.

Reason—Proposed rates are same as present rates from Oriskany Falls, N. Y., to same points.

27890. To revise the rates on (A) **crushed stone**, carloads (See Note 2), (B) **ground limestone**, carloads, from Blakeslee, N. Y., to D. L. & W. and L. V. R. R. stations, South Wilkes-Barre, Mehoopany, Satterfield, Sayre, Penn., Willow Creek, Geneva, Rushville, Auburn, Fair Haven, Cayuga Jct., N. Y., Binghamton, Scranton, Taylor, Kingston, Penn., Binghamton, Horseheads, Mt. Morris, Syracuse, Oswego, Norwich, Utica, N. Y., and various; (A) rates ranging from 91c to $1.95; (B) rates ranging from $1.03 to $2.20 per net ton. From Jamesville, N. Y., to points on the D. L. & W. and L. V. R. R. points, Willards, Norwich, Cedarville, Richfield Springs, Chadwick, New Hartford, Utica, N. Y., South Wilkes-Barre, Kingston, Sugar Run, Towanda, Bernice, Sayre, Penn., Waverly, Ithaca, Willard, Geneva, Victor, Rochester Jct., Elmira, Snyder, Gracie, Truxton, Chittenango, Canastota, South Bay, Camden, Owego, Richford, Auburn, Sterling, Ludlowville, Half Acre, N. Y., and various: (A) rates ranging from 91c to $1.80, and (B) rates ranging from $1 to $2 per net ton. (See Note 5.)

M-1891. **Sand and gravel**, carloads (See Note 2), from Morristown, N. J., to Summit, N. J., 35c per net ton. Present rate, 50c. (See Note 4.)

27808. **Slag**, carloads (See Note 2), from Hokendauqua, Penn., to Tannersville, Penn., $1.20 per net ton.

27898. **Stone, natural** (other than bituminous asphalt rock), **dust**, carloads, in shipping containers, loaded on container cars, **stone, natural** (other than bituminous asphalt rock), **crushed**, carloads, in shipping containers loaded on container cars, minimum weight 110,000 lb., from Feura Bush, N. Y., to Coxsackie and W. Athens, N. Y., 60c per net ton. (See Note 4.)

27901. **Stone, natural** (other than bituminous asphalt rock), **crushed**, carloads (See Note 2), from Gasport to Rochester (State Street Station), N. Y., 91c, and from Akron, N. Y., to Gasport, N. Y., 91c per net ton. Reason—Proposed rates are comparable with rates in the reverse direction.

M-1898. **Crushed stone**, carloads (See Note 2), from Union Furnace, Penn., to Phillipsburg, Penn., 70c per net ton. Rate to expire December 31, 1931. Reason—To meet motor truck competition.

27748. **Crushed stone**, carloads (See Note 2), from Carpenterville, N. J. To points in Pennsylvania (proposed rates in cents per net ton):

Delaware Water Gap	$0.95	Cresco	1.00
Stroudsburg	1.00	Mountain Home	1.10
East Stroudsburg	1.00	Mt. Pocono	1.10
Analomink	1.00	Tobyhanna	1.10
Henryville	1.00	Pocono Summit	1.10
		Gouldsboro	1.10

27923. **Gravel and sand**, N. O. I. B. N. in O. C., except blast, engine, foundry, glass, molding, quartz, silex and silica, carloads (See Note 2), from East Stroudsburg or Stroudsburg, Penn., to Scranton, Penn., $1 per net ton. Present rate, $1.15. Reason—Proposed rate compares with rate from Lime Ridge, Penn.

27929. **Crushed stone**, carloads (See Note 2), from Cockeysville, Md., to Bennings and Washington, D. C., 90c per net ton, and from Bluemont, Md., to Bennings, D. C., 90c. Reason—Proposed rates are comparable with rates from Lime Kiln, Penn., Kearnysville, Md., and Martinsburg, W. Va.

Note 1—Minimum weight marked capacity of car.

Note 2—Minimum weight 90% of marked capacity of car.

Note 3—Minimum weight 90% of marked capacity of car, except that when car is loaded to visible capacity the actual weight will apply.

Note 4—Reason—To meet motor truck competition.

Note 5—Reason—Proposed rates are comparable with rates on like commodities for like distances, services and conditions.

CENTRAL FREIGHT ASSOCIATION DOCKET

29547. To establish on **sand** (except blast, core, engine, filter, fire or furnace, foundry, glass, grinding or polishing, loam, molding or silica) **and gravel**, carloads, from Hugo, O., to Concord, O., rate of 90c per net ton. Route: Via N. Y. C. R. R., Painesville, O., and B. & O. R. R. Present rate, 100c.

29548. To establish on **fluxing limestone**, carloads (See Note 3), from Annandale, Branchton, Harrisville and Osbornes, Penn., to Vandergrift, Penn., rate of 110c per gross ton. Present rate, 16½c.

29549. To establish on **crushed stone and crushed stone screenings**, carloads, from Marblehead, O., to A. A. R. R. stations Clare, rate of 165c, and Rosebush, Mich., 155c, and P. M. Ry. stations Almont, 195c, Memphis 185c, and Weidman, Mich., 175c per net ton. Present rates: 475c to Clare and Rosebush, Mich., 445c to Almont and Memphis, and 505c per net ton to Weidman, Mich.

29584. To establish on **stone, crushed**, carloads, from Shimer, O., to representative points in West Virginia, viz., Charleston, *125c, Huntington, 120c, Ranger and Ferrell, 130c, Omar, Argonne, Holden, Rum Junction, Amherstdale, Hetzel, Huff Junction, Seth, Red Dragon, Madison, Five Block and Red Warrior, 150c; Emmett and Edwight, 160c; Ridgeview and Fork Junction, 140c, and Charleston, 125c per net ton. Route—Via N. & W. Ry., Kenova, W. Va., C. & O. Ry. Present, class rates.

*Route—Via N. & W.-Kenova, B. & O.-Point Pleasant, and N. Y. C. R. R.

29639. To establish on **sand** (except blast, core, engine, filter, fire or furnace, foundry, glass, grinding or polishing, loam, molding or silica) and **gravel**, carloads, from Sandusky, O., to Marblehead, O., rate of 60c per net ton. Present, 70c.

29640. To establish on **crushed stone**, in open-top cars, carloads, actual weight will apply, from Bellevue, O., to Longs and Lisbon, O., rate of 135c per net ton. Route, via W. & L. E. Ry., Creston, O., Erie R. R. Present, 17c.

29645. To establish on **sand** (except blast, core, engine, filter, fire or furnace, foundry, glass, grinding or polishing, loam, molding or silica) and **gravel**, carloads, Ashtabula and Ashtabula Harbor, O., to Jamestown, Penn., and Simons, O., rate of 70c per net ton. Present, 90c.

29646. To establish on **sand** (other than blast, core, engine, filter, fire or furnace, foundry glass, grinding or polishing, loam, molding or silica) and **gravel**, carloads, from Winona Lake and Warsaw, Ind., to Bippus, Bolivar, Disko, Huntington, Laketon and Servia, Ind., rate of 70c per net ton. Present, 88c to Bippus, Huntington and Servia and 80c to Bolivar, Disko and Laketon, Ind.

29649. To establish on **stone, crushed**, in bulk, in open-top cars, carloads, from Bloomville, O., to Bucyrus and Hines, O., rate of 60c per net ton. Present rate, 50c.

29650. To establish on **crushed stone**, in bulk, in open-top cars, carloads, from Woodville, O., to Cleveland, O., rate of 80c per net ton via P. R. R. direct, proposed rate to expire March 31, 1932. Present rate, 90c via P. R. R., Maple Grove, O., N. Y. C. & St. L. R. R.

SOUTHWESTERN FREIGHT BUREAU DOCKET

23577. **Asphaltic limestone**, from Cherokee and Margerum, Ala., to points in Arkansas, Kansas, Louisiana, Missouri, Oklahoma and Texas. To amend Item 20, S. W. L. Tariff 99-A, applying on limestone, from Cherokee and Margerum, Ala., to Arkansas, Kansas, Louisiana, Missouri, Oklahoma and Texas, by adding the following paragraph as an additional application: "Asphaltic limestone, broken, crushed or ground, containing not more than 5% artificially added asphalt, in carloads (See Note 3)," The rates published from Margerum and Cherokee, Ala., into the Southwest are limited so that they may not be applied on a ready-to-lay article. The Southwestern Lines, however, have published a description which includes asphalt rock, a ready-to-lay article. In view of the fact that the scale from the Southwest applies on the ready-to-lay article as well as the article to which some ingredients have to be added, the producers at the Alabama points are preparing to treat the natural article so that they may be in position to ship a ready-to-lay material. The ready-to-lay material from Texas is higher grade article. It is the opinion of shippers at Cherokee and Margerum, Ala., that since the Southwestern Lines may ship the crude material and the ready-to-lay material on the same basis of rates, that they should be permitted to enjoy the same scale on the ready-to-lay article as well as the crude material.

23591. **Asphalt rock**, from Dougherty, Okla., to interstate points. To establish rates on asphalt rock, carloads (See Note 3), from Dougherty, Okla., to points in Kansas, Missouri, Nebraska (including the Missouri River cities), and destinations in Western Trunk Line territory east of the Missouri River, based upon the distance schedules of rates as prescribed by the Interstate Commerce Commission in decision of June 25, 1931, in I. C. C. Docket No. 23094, Alabama Rock Asphalt, Inc., vs. A. & S. Ry. Co. et al., after having extended the rates beyond 800 to 1000 miles at the same rate of progression as the last block of the scale, i.e., at 10c for each 30 miles. The proposed scale is shown below, and distances are to be computed over the shortest routes by which carload traffic can be moved without transfer of lading. Rates in cents per ton:

Miles	(1)	(2)	Miles	(1)	(2)
10 and less	70	90	320 to 350	235	245
10 to 20	80	100	350 to 380	245	250
20 to 30	90	110	380 to 410	255	260
30 to 40	100	120	410 to 440	265	270
40 to 50	105	125	440 to 470	275	280
50 to 60	110	130	470 to 500	285	285
60 to 70	115	135	500 to 530	290	290
70 to 80	120	140	530 to 560	300	300
80 to 90	125	145	560 to 590	310	310
90 to 100	130	150	590 to 620	320	320
100 to 110	135	155	620 to 650	330	330
110 to 120	140	160	650 to 680	340	340
120 to 130	145	165	680 to 710	350	350
130 to 140	150	170	710 to 740	360	360
140 to 150	155	175	740 to 770	370	370
150 to 160	160	180	770 to 800	380	380
160 to 170	165	185	800 to 830	390	390
170 to 180	170	190	830 to 860	400	400
180 to 190	175	195	860 to 890	410	410
190 to 200	180	200	890 to 920	420	420
200 to 230	200	210	920 to 950	430	430
230 to 260	210	220	950 to 980	440	440
260 to 290	220	230	980 to 1000	450	450
290 to 320	230	235			

(1) Single line rate. (2) Joint line rate.

The distance schedules of rates prescribed by the I. C. C. in Docket No. 23094 were prescribed to be applied interstate from Alabama and Texas producing points of asphalt rock to all destinations

within Southwestern Committee territory, and the Southwestern Committee Lines have made a record to apply the basis interstate between all points within southwestern territory. It is considered reasonable to propose the application of these distance rates interstate from Dougherty, Okla., to the destination territory covered in this proposal. In fact it might be reasonable to propose a lower scale of rates, considering the generally lower level of rates applicable in Western Trunk Line territory as compared with Southwestern territory.

23636. **Asphalt rock,** from Texas points to Baltimore, Md., and New York, N. Y. To establish a rate of 30c per 100 lb. on asphalt rock, natural or coated with road oil, in packages or in bulk, carloads, minimum weight 50,000 lb., from Blewett, Dabney, Cline, Standard Mine and Whites Mine, Tex., to Baltimore, Md., and New York, N. Y. Note—Shipments in bulk can not be handled on ships of "Morgan Line" except by installation of special bulkheads, flooring, etc., and it is impracticable to provide for this installation on all vessels. Therefore shipments should not be sent to Gulf ports to be forwarded via "Morgan Line" unless arrangements are made with carrier to handle on specific sailing: If such arrangements are not made, demurrage accruing at Gulf ports pending sailing of vessel in which shipment can be handled will be chargeable against the shipper and will not be absorbed by the "Morgan Line."

There is a growing market for this commodity at eastern points adjacent to the ports of Baltimore and New York, but Texas shippers cannot compete on the present rates with liquid asphalt from California and the Island of Trinidad.

ILLINOIS FREIGHT ASSOCIATION DOCKET

6317. **Sand and gravel,** carloads, from Worth, Ill. Rates per net ton. To points in Illinois.

	Pres.	Prop.		Pres.	Prop.
Lodge	$1.01	$0.88	Morrisonville	1.39	1.13
Taylorville	1.39	1.13	Harvel	1.39	1.13
Clarksdale	1.39	1.13	Raymond	1.39	1.13
Palmer	1.39	1.13			

Proposed I. C. C. Decisions

24144. Sand. Continental Roll and Steel Foundry Co. et al. vs. N. Y. C. et al., embracing also No. 24291, National-Erie Co. vs. N. Y. C. By Examiner C. Garofalo. Recommends Commission find interstate rates, sand, unreasonable to extent they exceeded, from Polk, Penn., $1.20 to Coraopolis and Kendall, Penn., and $1.30 to Glassport and Homestead, Penn., and award reparation. In 24291 recommends that Commission find interstate rate on same commodity Polk to Erie, Penn., was, is and for the future will be unreasonable to the extent it exceeded, exceeds or may exceed $1.10, and award reparation.

24099. Sand and Gravel to Illinois. Examiner Burton Fuller, in Missouri Gravel Co. vs. C. B. & Q. et al., has proposed that the commission shall find unreasonable the rates on sand and gravel from LaGrange and Reading, Mo., to destinations in Illinois on the Chicago and Alton as far north as Chenoa, Ill., prescribe new ones and award reparation. In a prior decision, Missouri Gravel Co. vs. C. B. & Q. et al., 132 I. C. C. 200, the commission prescribed rates from LaGrange to destinations on the Alton. This complaint attacked rates beyond the area covered in the prior case.

In this report Examiner Fuller recommended the prescription of rates from Reading and LaGrange, ranging from LaGrange to destinations in Illinois, from 101 to 139c a ton and from Reading ranging from 88c to 126c.

Reopens Rate Case in Georgia

IN No. 17517, rates on chert, clay, sand and gravel within the state of Georgia, and cases grouped therewith, the Interstate Commerce Commission has reopened for further hearing Nos. 17517, 17699, 17699, sub number 1, 17764, 17764, sub number 1, 17763, 17689, 19512, 22109, and I. and S. Nos. 2470 and 3250, solely as to the following questions:

1. Whether one scale of rates should be approved or prescribed in these proceedings for application to both single-line hauls and joint-line hauls of the traffic aforesaid in lieu of the two scales, one for single-line application and the other for joint-line application, heretofore approved or prescribed in these proceedings.
2. If one scale for both single-line and joint-line application should be approved or prescribed, what should that scale be in order to yield approximately the same revenue as is being produced from the application of the aforesaid two scales heretofore prescribed in these proceedings.
3. Whether arbitraries, in addition to the scale or scales which may be approved or prescribed as the result of the further hearing as aforesaid, should be accorded to any so-called short or weak line, and if so what such arbitraries should be.

Referring to various petitions received in these proceedings for reopening the commission said that in so far as they requested modification of the outstanding orders in any of the reopened proceedings they were denied, and that the outstanding findings and orders in the reopened proceedings should continue in full force and effect. It consolidated for hearing with the further hearings to be had in the reopened proceedings, I. and S. No. 3625, sand, gravel, slag, stone and chert, between points in southern territory. It said the petition filed in No. 3625 requesting modification of the order of suspension was denied.

The proceedings are to be set for further hearing, or hearings, as the case may be, at such times and places as the Commission may hereafter direct.

Orders Differential in Open Top and Box Car Rates Cancelled

HOLDING that the railroads attempted merely a "piecemeal" rate adjustment, the Interstate Commerce Commission has ordered them to cancel by December 3 tariffs which proposed to force higher rates on dolomite, fluxing stone, agricultural limestone and gravel, in carloads, between various points in central freight association territory when the shipments move in box cars than when in open top equipment.

The tariffs were to have become effective February 15, 1931, and later dates, but were suspended by the commission on protest of the Blue Ridge Glass Corp., Kingsport, Tenn.; National Mortar and Supply Co. and American Window Glass Co., Pittsburgh; National Lime and Stone Co., Findlay, Ohio, and Mid-West Rock Products Corp., Indianapolis, Ind.

The method employed by the railroads was to attempt to restrict present rates on the commodities named to apply only to shipments in open top equipment, thus forcing shippers to pay the higher class rates when using box cars. At the same time the carriers proposed to file a tariff naming rates based on 60% of 6th class for application to the commodities named when moving in box cars, when no rates of this character were in effect.

The railroads contended that the present rates on the commodities involved were not uniform in central territory and that, because in certain instances the rates were restricted to box car movements only, some producers were preferred and given undue advantage over their competitors. They said that if the suspended tariffs were permitted to go into effect greater uniformity in the rate structure would result. This contention, the commission said, was not entirely supported by the record.

The commission pointed out that no producers of limestone intervened in behalf of the carriers or complained that the present adjustment was prejudicial to their business. All the protestants, on the other hand, contended that the present rates were on a competitive basis which would be disrupted if the suspended schedules went into effect.

The commission admitted that in certain instances the suspended tariffs would remove inequalities in existing rates. However, they also would create other and probably greater disparities, it was said.

"From the foregoing we are convinced that the piecemeal adjustment here attempted would result in a more confused condition of the limestone rates than now exists," the commission said. "Respondents express the hope that we will prescribe a reasonable basis of rates on limestone in box cars under which they can revise all the rates from all producing points and put them on the same level.

"This would be tantamount to a general revision of the limestone rates without notice to all produers and shippers of this commodity. Furthermore, respondents in this proceeding have not seriously attempted to show that the present basis of rates is lower than reasonable, but their evidence was directed mainly to showing that they should receive more for the transportation of limestone in box cars than in open top equipment for the reasons stated hereinbefore."

Suspends Rate Increase on Crushed Stone

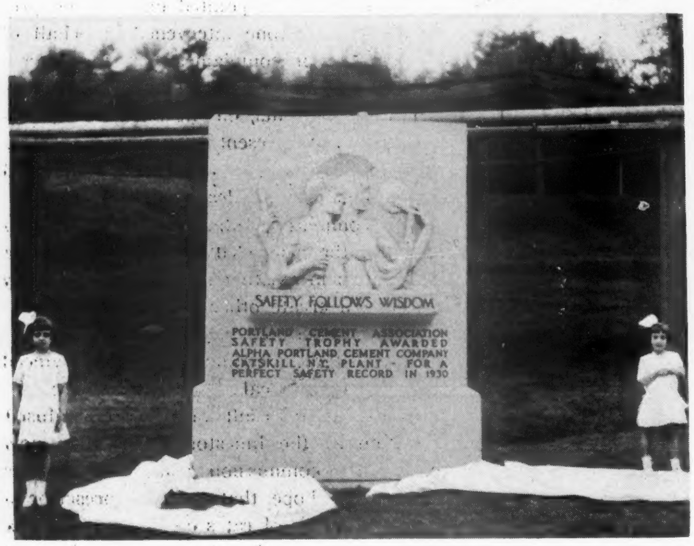
TARIFFS filed by the railroads proposing increases in their freight rates on various classes of crushed stone throughout most of the territory east of the Rocky Mountains were suspended by the Interstate Commerce Commission, in an order made public recently, for a period of seven months from September 9, pending an investigation.

The tariffs apply to stone, limestone, granite, marble, slate, crushed, ground, pulverized or powdered. Increases would result generally, the commission said, from the proposal to cancel the present commodity rates and to apply instead the full classification basis or combination rates.—*New York* (N. Y.) *Journal of Commerce.*

P. C. A. Safety Trophy Unveiled at Cementon, N. Y.

Appropriate Ceremonies Mark Event at Eastern Alpha Mill

THE handsome cast stone safety trophy awarded by the Portland Cement Association last spring to the Cementon, N. Y., plant of the Alpha Portland Cement Co. for no lost-time accidents during 1930, was unveiled with appropriate ceremonies at the plant near Catskill on October 15. Schools were dismissed and the residents of the village, to the number of about 700, joined with employes and their families, visiting officials and invited guests in making the occasion a real community celebration. The trophy stands on an attractive green parkway between the office, the machine shop and the storehouse, where the party assembled. The entire afternoon was given over to the celebration. E. C. Sandt, plant chemist, presided at the dedication. After the meeting was called to order the invocation was pronounced by Rev. Lawrence Pizzuti. L. E. Andrews, assistant engineer of the Portland Cement Association at New York, then presented the trophy to the plant. He congratulated heartily the entire plant force for establishing so enviable a record and also the community for having so progressive an industry established there. The beautiful monument was unveiled by the Misses Pearl and Juanita Ziegler, daughters of Daniel Ziegler, plant engineer and one of the most activet members of the plant safety committee.



Unveiling of safety trophy

At that point rain, which had been threatening for some time, began to fall and an adjournment was taken to the inside of the machine shop for the remainder of the program. The rain failed to dampen the ardor of the gathering and keenest interest was maintained throughout the program.

The trophy was accepted by Edward M. Flanagan, foreman of the machine shop, who said the monument ever would be a reminder to the men of the importance of carefulness in the exercise of their duties. The men of the plant were happy to have present as guest of honor Gabriel S. Brown, president of the company.

Remarks by G. S. Brown

Mr. Brown was introduced by Mr. Sandt as one of the outstanding safety boosters of the cement industry. Mr. Brown prefaced his remarks by extending congratulations and best wishes of the officers and directors of the company to the officials and employes at the plant. Safety work, said Mr. Brown, is of just as much interest to the directors and officers of the company as it is to the workers themselves. He recalled that at one time it had been an accepted necessity that a cement plant could not be operated without workers being killed or maimed. It is in accordance with the facts that it is a humanitarian interest that prompts the officers and directors of the company in their work for accident prevention.

"It has been asked," he said, "why should you worry about accidents when you are covered by compensation?

"I will answer that question with another. What good is compensation to the workman when he is maimed and has to go through life permanently disfigured?"

It is a real sorrow to the officers as well as to the employes, in case of accident or death in any of the plants, he said. He amplified his remarks in regard to compensation by saying that the safety bonus paid the workers more than offset the amount saved in insurance through safety efforts. "There is nothing more gratifying to us," he said, "than a no-accident record in all of our plants."

Mr. Brown struck a bright note in conclusion, saying that the industry had passed through several years of hard times, but there was hope that it would not be long before all plants will be working fully and safely.

In thanking him for his remarks, Mr. Sandt said the employes would endeavor to continue their record so that there "will be no heartaches on your desk at Easton."

Mr. Sandt then introduced Frank G. McKelvey, vice-president of the company in charge of operations; N. D. Colburn, general superintendent of the company and former superintendent of the Catskill plant; W. W. Hamilton, the company's safety director; Arch Brown, superintendent of the Catskill plant; Daniel Ziegler, chairman of its safety committee, and Dr. Mahlon H. Atkinson, company physician.

John Dowling, member of the division of industrial hygiene of the New York State

Scene at dedicatory exercises

Department of Labor, addressed the gathering on "Safety Always."

Rev. Clarence E. Brown, pastor of the First Baptist church, Catskill, spoke in lighter vein, but bringing out inspiringly and convincingly that safety is possible through wisdom, understanding and cooperation.

The program was concluded with singing of "The Star Spangled Banner" by the gathering and the benediction by Rev. S. M. Mountz, pastor of St. Paul's Lutheran church at West Camp.

Once more the sun smiled through and the gathering again adjourned to the out of doors, where the company furnished delightful refreshments of sandwiches, coffee, cake, ice cream and soft drinks to all, and cigars. During the serving of refreshments a program of entertainment was presented by workers in the plant.

Several Years' Effort

The trophy represents the reward for several years' determined effort on the part of the plant personnel. The plant almost won the association trophy in 1929, but because a workman was awarded compensation for a slight stiffening of a finger, although he lost no time, the trophy was denied by the Association's Committee on Accident Prevention and Insurance. However, the plant organization, from Superintendent Arch Brown down to the most recent workman, resolved that the plant should win the 1930 award with an absolutely perfect record.

The plant's safety committee is composed of Daniel L. Ziegler, chairman, and A. Brown, E. C. Sandt, W. Kolar, A. Geneis, H. F. Pysher, J. G. Meiler, E. M. Flanagan, S. Orsulich, F. Merritt, P. D. Moon, C. Thorn, A Ferretti, W. Acker, G. Notarnicola, W. J. Burger, T. Erceg, E. L. Sinnott and J. Wynkoop. The delegates selected by their plant organization to receive the formal award from the Portland Cement Association in New York were E. M. Flanagan and W. H. Garis.

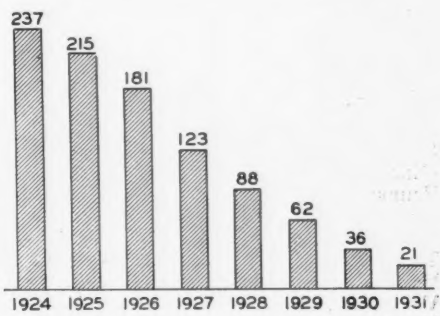
September Accidents

During the month of September the member mills of the Portland Cement Association suffered a total of 21 accidents, 20 of them causing loss of time and one resulting fatally. In September, 1930, there were 34 lost-time and 2 fatal accidents.

The fatal accident which occurred during September, 1931, was one of the strongest recorded in the history of cement mill accident prevention work. According to reports, which there was a great deal of difficulty in obtaining, a mine watchman, without any connection with his work and without authority, operated a gasoline locomotive along the mine trackage, hauling one car in which were six supposed sight-seers, all members of his family. Previously this watchman had placed a barricade across the entry to prevent mules from passing this point. Into this barricade he ran the locomotive and car. He was struck in the head by timbers, resulting in skull fractures with fatal termination.

In the only permanent disability accident of the month a quarry switchman picked up a sledge hammer and struck the rocker side arm of a car, which was displaced. The jar of the side arm going into place either knocked the injured man's hand loose from the sledge handle or caused him to let go. The second and third fingers of the left hand were lacerated, causing loss of the second finger.

A third quarry accident of the month occurred when a link in the hoisting chain on a steam shovel broke while the shovel was in operation. The slack of the chain ran back over the sheaves, jamming between the sheave and chain guard, causing the free end to strike crane operator on shoulder and back. His injuries consisted of contusions to left shoulder and to lower back ribs.



Comparison of September accidents

There are still 50 cement plants which have had no lost-time accidents since January 1 and which have operated six months or more during that time. At this date last year, with some 15 more mills in operation, 51 mills qualified similarly.

Better Homes Manual

Answering the thousands of questions which have been asked it since its organization several years ago, Better Homes in America, Inc., has just issued in book form 782 pages of information on home building, financing and remodeling under the title, "The Better Homes Manual," published by the University of Chicago Press.

Better Homes in America, Inc., is one of the associations on the planning committee for the President's national conference on home building and home ownership to be held in December, and the book is the result of several years' research in support of Secretary of the Interior Wilbur's contention that "good public policy involves provision for informing the general public on the practical details of house architecture, construction, and equipment, and each of the processes involved in the purchase or financing of the house and management of the home." Secretary Wilbur is president of Better Homes in America, President Hoover is honorary chairman, and Professor James Ford of Harvard University is executive director. The "Better Homes Manual" is edited by Blanche Halbert, research director of the organization.

Among those who have contributed to the book are James S. Taylor, chief of the division of building and housing, U. S. Department of Commerce; John M. Gries, executive secretary of the President's conference on home building and home ownership; William Green, president, American Federation of Labor; Nelson S. Perkins, construction engineer, national committee on wood utilization, U. S. Department of Commerce; C. Stanley Taylor, president, Taylor, Rogers & Bliss, Inc.; Jordan A. Pugh, of the Common Brick Manufacturers' Association, and many other building authorities.

To Give New Trophy for Crushed Stone Safety Competition

A new trophy which is to be competed for by members of the National Crushed Stone Association is being provided by *The Explosives Engineer,* it is announced by Theodore Marvin, editor. The trophy goes to the quarry which leads the members of the association in the annual National Safety Competition conducted by the U. S. Bureau of Mines for the Sentinel of Safety trophies.

Because of the outstanding record of winning the quarry trophy for three successive years, Cape Girardeau plant of the Marquette Cement Manufacturing Co. has gained permanent possession of the former trophy offered by *The Explosives Engineer.*

The trophy is a bronze plaque symbolic of quarrying. It is a facsimile of a scene on the Sentinels of Safety trophy which is offered by *The Explosives Engineer* to the winners of the National Safety Competition, the great nationwide contest when coal mines, metal mines and quarries compete in safety.

Certificates of honor from the Secretary of Commerce were given to 15 quarry companies who went through the year without a lost-time accident.

In winning the 1930 contest the Marquette plant had a perfect safety record with a total exposure of 224,514 man-hours. The new trophy, according to Mr. Marvin, will be ready for the 1931 winner of the National Crushed Stone contest.

Europe to Stabilize Asbestos

Arrangements have been completed between the principal producers of raw asbestos in Soviet Russia and Rhodesia in collaboration with the main European consumers, with a view to stabilizing the market.—*Wall Street* (N. Y.) *Journal.*

Quarry Accident Statistics for 1930

THE accompanying tables, containing information concerning accidents in the quarrying industry in 1930, have been given out by the United States Bureau of Mines. A more extended printed report will be issued later, copies of which may be had upon application to the United States Bureau of Mines, Washington, D. C.

Reports from companies operating in 1930 revealed a better safety record than the quarrying industry has ever known before. In no previous year has the combined number of deaths and injuries from accidents been as low, in proportion to the number of men employed, as it was in 1930. The death rate during the year, which was 1.53 per thousand workers, was 7% lower than the previous year's rate of 1.65. The injury rate, which indicated 108 injuries among each thousand employes, as compared with 128 in 1929, was lower than the corresponding rate for any previous year.

A total of 80,633 quarry employes was reported, which was a reduction of 6% from the number employed in 1929. The man-days of labor performed was 20,559,372 or 10% less than in 1929, and the average number of working days per man was 255 as compared with 268 in the preceding year. Accidents resulted in 105 deaths and 7,417 injuries; the corresponding record for the previous year being 126 deaths and 9,810 injuries. Reported injuries include those which result in disability for more than the remainder of the day on which the accident occurred.

The quarries covered by this report have been classified according to the kind of rock quarried, as follows: Cement rock, granite, limestone, marble, sandstone and bluestone, slate, and trap rock. These quarries were further divided into two classes—those that produced dimension stone for monuments, building, etc., and those that produce stone to be crushed for use in the manufacture of cement or lime, or as ballast, or for any other purpose that does not require the stone to be of any particular shape or dimension.

QUARRY ACCIDENTS BY STATES DURING 1930

State	Active operators	Men employed	Equivalent in 300-day workers	Man-days of labor	Average days active	Number killed	Number injured	Rate per thousand 300-day workers: Killed	Rate per thousand 300-day workers: Injured
Alabama	22	2,162	1,929	578,674	268	1	196	0.52	101.61
Arkansas	12	423	309	92,634	219	......	27	......	87.38
California	105	3,952	3,606	1,081,782	274	8	584	2.22	161.95
Colorado	18	633	451	135,207	214	......	62	......	137.47
Connecticut	21	667	594	178,163	267	2	76	3.37	127.95
Georgia	23	2.488	2,231	669,198	269	1	144	.45	64.55
Illinois	43	3,723	3,339	1,001,798	269	8	223	2.40	66.79
Indiana	40	5,096	4,238	1,271,491	250	7	377	1.65	88.96
Iowa	21	1,618	1,611	483,342	299	8	182	4.97	112.97
Kansas	20	1,334	1,196	358,669	269	2	92	1.67	76.92
Kentucky	25	1,254	1,009	302,774	241	5	111	4.96	110.01
Maine	25	1,740	1,486	445,936	256	2	160	1.35	107.67
Maryland	31	1,150	928	278,481	242	3	130	3.23	140.09
Massachusetts	53	2,068	1,615	484,618	234	6	411	3.72	254.49
Michigan	19	2,250	2,145	643,511	286	......	125	......	58.28
Minnesota	33	1,443	1,217	365,102	253	1	204	0.82	167.63
Missouri	47	3,082	2,590	776.893	252	1	433	0.39	167.18
New Hampshire	16	665	562	168,584	254	......	96	......	170.82
New Jersey	32	1,708	1,338	401,424	235	4	120	2.99	89.69
New Mexico	5	101	40	11,956	118	......	3	......	75.00
New York	81	4,431	3,663	1,098,760	248	4	425	1.09	116.03
North Carolina	10	1,283	941	282,148	220	......	95	......	100.96
Ohio	75	5,485	4.712	1,413,640	258	7	427	1.49	90.62
Oklahoma	10	1,001	1,029	308,712	308	......	90	......	87.46
Pennsylvania	236	13,747	11,442	3,432,739	250	13	1,070	1.14	93.52
Rhode Island	8	153	141	42.287	276	......	11	......	78 01
Tennessee	28	2,949	2,366	709,708	241	6	230	2.54	97.21
Texas	27	1,999	1,769	530.712	265	......	150	......	84.79
Utah	12	411	274	82,105	200	3	36	10.95	131.39
Vermont	46	3,865	3,560	1,068,051	276	5	380	1.40	106.74
Virginia	43	1,885	1,543	462.775	246	3	194	1.94	125.73
Washington	24	719	605	181,636	253	......	41	......	67.77
West Virginia	18	1,678	1,245	373,508	223	1	82	0.80	65.86
Wisconsin	52	1,528	1,175	352,635	231	2	218	1.70	185.53
Not segregated	54	1,942	1,632	489,719	252	2	212	1.23	129.90
Total	1,335	80,633	68,531	20,559,372	255	105	7,417	1.53	108.23
Total prev. year	1,382	85,561	76,559	22,967,579	268	126	9,810	1.65	128.14

TOTAL QUARRY ACCIDENTS IN THE UNITED STATES DURING 1930 DIVIDED ACCORDING TO KIND OF QUARRY

Kind of quarry	Active operators	Men employed	Equivalent in 300-day workers	Man-days of labor	Average days active	Number killed	Number injured	Rate per thousand 300-day workers: Killed	Rate per thousand 300-day workers: Injured
Cement rock	101	19,998	19,883	5,964,948	298	17	678	0.86	34.10
Granite	230	10,414	8,325	2.497,394	240	12	1,191	1.44	143.06
Limestone	657	34,193	27,636	8,290,818	242	49	3,946	1.77	142.78
Marble	41	6,087	5,601	1,680.301	276	6	512	1.07	91.41
Sandstone	130	3,545	2,510	752,974	212	7	305	2.79	121.51
Slate	62	2,955	2,123	636.978	216	1	323	0.47	152.14
Trap rock	112	3,441	2,453	735,959	214	13	462	5.30	188.34
Total	1,333	80,633	68,531	20,559,372	255	105	7,417	1.53	108.23

TOTAL ACCIDENTS DURING 1930 ACCORDING TO KINDS OF QUARRYING

Kind of quarry	Men employed	Equivalent in 300-day workers	Man-days of labor	Average days active	Number killed	Number injured	Rate per thousand 300-day workers: Killed	Rate per thousand 300-day workers: Injured
All quarries:								
In quarry	39,073	30,001	9,000,450	230	74	4,652	2.47	155.06
*Outside	41,560	38,530	11,558,922	278	31	2,765	0.80	71.76
Total	80,633	68,531	20,559,372	255	105	7,417	1.53	108.23
Dimension stone:								
In quarry	10,756	8,559	2,567,731	239	20	1,291	2.34	150.84
*Outside	11,531	9,990	2,996,859	260	9	1,058	0.90	105.91
Total	22,287	18,549	5,564,590	250	29	2,349	1.56	126.64
Nondimension stone:								
In quarry	24,831	18,826	5,647,870	227	47	2,864	2.50	152.13
*Outside	27,789	26,683	8,004,942	288	21	1,541	0.79	57.75
Total	52,620	45,509	13,652,812	259	68	4,405	1.49	96.79
All other and not stated:								
In quarry	3,486	2,616	784,849	225	7	497	2.68	189.98
*Outside	2,240	1,857	557,121	249	1	166	0.54	89.39
Total	5,726	4,473	1,341,970	234	8	663	1.79	148.22

*"Outside" men include employes engaged in crushing, rockdressing, and manufacturing lime or cement.

Interest Grows in Safety Contest

W. W. ADAMS, chief statistician, demographical division, United States Bureau of Mines, Washington, D. C., reports that sand and gravel producers are showing an increasing interest in the safety contest conducted by the National Sand and Gravel Association for trophies awarded each year by ROCK PRODUCTS.

In this year, 1931, the third that the contest has been conducted, the enrollment is 98 plants; in 1930 it was 76 plants, and in 1929 only 26 plants.

Chemical Engineering Catalog Issued

THE 1931 EDITION of the Chemial Engineering Catalog has been issued. It contains collected, condensed and standardized catalog data of equipment, machinery, laboratory supplies, heavy and fine chemicals and raw materials used in the industries employing chemical processes of manufacture. It also contains classified indexes of such equipment and materials carefully cross-referenced, and a technical and scientific books section, cataloging and briefly describing a practically complete list of books in English on chemical and related subjects.

Producers in the rock products industry whose products are advertised include the Philadelphia Quartz Co., Pacific Coast Borax Co., Louisville Cement Co., Kelly Island Lime and Transport Co., Industrial Chemical Sales Co., Inc., Hunkins-Willis Lime and Cement Co., Diamond Alkali Co., Dow Chemical Co., Binney and Smith Co., United States Gypsum Co. and American Potash and Chemical Corp.

This catalog is published by the Chemical Catalog Co., Inc., New York, N. Y.

FATALITY AND INJURY RATES* PER THOUSAND 300-DAY WORKERS IN ALL QUARRIES IN THE UNITED STATES DURING THE CALENDAR YEARS 1927 TO 1930

	Killed				Injured			
	1927	1928	1929	1930	1927	1928	1929	1930
All quarries:								
In quarry	2.39	1.99	2.18	2.47	193.50	162.46	172.48	155.06
Outside quarry	.87	.99	1.18	.80	132.17	100.34	89.21	71.76
Total	1.63	1.46	1.65	1.53	162.92	129.95	128.14	108.23
Dimension stone:								
In quarry	2.22	2.21	1.43	2.34	199.52	156.22	169.14	150.84
Outside quarry	.86	.29	.48	.90	179.89	131.36	113.55	105.91
Total	1.58	1.24	.94	1.56	190.22	143.74	140.50	126.64
Nondimension stone:								
In quarry	2.55	1.90	2.59	2.50	189.04	166.00	176.18	152.13
Outside quarry	.75	1.20	1.36	.79	105.61	78.60	74.02	57.75
Total	1.60	1.52	1.90	1.49	144.91	117.97	118.94	96.79

*Rates are based upon all lost-time accidents.

QUARRY ACCIDENTS DURING 1930, ACCORDING TO CAUSES AND SEVERITY OF INJURY

		Non-fatal				
Cause	Killed	Permanent total[1]	Permanent partial[2]	Temporary[3]	Total non-fatal	Grand total
In and About Quarry:						
Falls or slides of rock or overburden	24	....	15	404	419	443
Handling materials	5	1	13	1,294	1,308	1,313
Timber or hand tools	....	2	1	128	131	131
Explosives	14	2	19	110	131	145
Haulage	6	1	23	381	405	411
Falls of persons	4	1	6	294	301	305
Falling objects (other than 1 and 2)	7	....	8	208	216	223
Flying objects	3	....	16	538	554	557
Electricity	1	....	1	20	21	22
Drilling and channeling (by machine or hand)	1	....	8	236	244	245
Machinery	8	2	38	286	326	334
Nails, splinters, etc.	....	....	1	94	95	95
Boiler and air-tank explosions	....	....	....	....	....	....
Burns	....	....	....	51	51	51
Other causes	1	....	12	438	450	451
Total	74	9	161	4,482	4,652	4,726
In Outside Works:						
Haulage	4	....	9	184	193	197
Machinery	10	....	37	323	360	370
Hand tools	....	....	3	146	149	149
Nails, splinters, etc.	....	....	....	82	82	82
Electricity	3	....	....	31	31	34
Falls of persons	5	....	6	308	314	319
Falling objects (rocks, timbers, etc.)	5	....	11	228	239	244
Flying objects	1	....	9	452	461	462
Handling materials	1	2	12	421	435	436
Burns	1	1	1	145	147	148
Other causes	1	....	4	350	354	355
Total	31	3	92	2,670	2,765	2,796
Grand Total	105	12	253	7,152	7,417	7,522

[1] Permanent total disability: Loss of both legs or arms, one leg and one arm, total loss of eyesight, paralysis, or other condition permanently incapacitating workman from doing any work of a gainful occupation.

[2] Permanent partial disability: Loss of one foot, leg, hand, eye, one or more fingers, one or more toes, any dislocation where ligaments are severed, or any other injury known in surgery to be permanent partial disability.

[3] Disability for more than remainder of day of accident.

Supplement to 1931 Book of A. S. T. M. Standards

THE 1931 SUPPLEMENT to the book of American Society for Testing Materials Standards has been issued. This book contains standards revised or withdrawn by action of the 1931 annual meeting approved by letter ballot of the society September 1, 1931.

Three changes that apply to the rock products industry are included in this supplement. They are the revision of the standard specifications for hydrated lime for structural purposes (C 6-24) in Part II, page 51; revision of the standard method of making and storing compression test specimens of concrete in the field (C 31-27) in Part II, page 139, and the standard methods of securing specimens of hardened concrete from the structure (C 42-27) in Part II, page 149.

Sues for Loss of Life While Working on Gravel Tow Boat

VIRGIL L. ROWLANDS, as administrator of the estate of Carroll D. Rowlands, has filed suit in common pleas court against E. R. Webster et al. of the Buckeye Sand and Gravel Co. of Beverly, Ohio. Carroll Rowlands, who was 19 years of age, was working for the company on a gasoline boat, which was towing the equipment, when his death by drowning occurred.

According to the petition, Mr. Rowlands and Brooks Webster, pilot, were the only ones aboard at the time the accident happened, when Mr. Rowlands walked along a narrow way as he went to oil the machinery. He tripped on a slippery piece of hose or pipe which lay on the floor and was precipitated into the river, drowning before assistance could reach him.

The plea is for $10,000 damages for loss of the young man's life and $364.75 funeral and burial expenses additional.—*Beverly* (Ohio) *Dispatch.*

Birmingham Slag Co. Constructs Office Building of Its Own Products

BIRMINGHAM SLAG CO., Birmingham, Ala., moved into its new office building on October 1. The building, located at 2019 Sixth Ave., North, is two stories and of fireproof construction. Cement products were used throughout, reinforced concrete being used for floors and roof slab, Slagtex brick for exterior walls and cement trimstone for front. Hardison Stone Co. made the trimstone and Slagtex brick and tile are products of the company.

Lehigh Portland Cement Co. is also occupying a portion of the building as its branch office.—*The Dixie Manufacturer.*

N. Y. State Crushed Stone Association Discusses Washing Stone

A VERY INTERESTING meeting of the New York State Crushed Stone Association was held at the New Yorker Hotel, New York City, October 23, with President A. S. Owens in the chair. After discussing the veto of the bond law by Governor Roosevelt after it had passed both houses of the legislature, the main subject of discussion was the washing of crushed stone. H. E. Rainer, Federal Crushed Stone Co., Buffalo, N. Y., reported for the committee of the association which had recently called on the state highway commissioner of New York to protest against the immediate application of the new specification of the department, requiring all crushed stone aggregate used in 1932 to be washed. This specification, incidentally, has already been modified to require "thorough cleaning" instead of washing.

The committee of the association which called on the state highway commissioner protested that business conditions at this time were such as to make it practically impossible for the industry to spend the $2,000,000 that it was estimated would be required to install washing equipment at the various plants. This was based on an estimate of about $40,000 worth of equipment per plant. The commissioner had promised a definite decision in a couple of weeks, and there was every reason to believe, the committee thought, that the application of the new specification would be temporarily postponed, but that the ultimate installation of washing or cleaning equipment was inevitable.

In the discussion that followed, led by President Owens in which he described the washing plant at his own quarries where it had been installed since the plant was built, it was obvious that not all the members of the association are opposed to the installation of washing equipment. Indeed, A. T. Goldbeck, director of engineering, National Crushed Stone Association, Washington, D. C., after discussing the possibilities of measuring the cleanliness of stone and suggesting the elutriation test as the best (with percentage loss in this test of 1.25%), said that he thought that in the long run it would be better for the industry to make washed stone, not because of the small percentage of dust, which is undoubtedly harmless, but as one method by which the wayside quarry operator might be eliminated. He also thought that the psychological effect of washed stone as a selling argument would be helpful to the industry.

Washing Plant of the Eastern Rock Products, Inc.

President Owens, in describing the washing plant at his operation (described in Rock Products, August 21, 1926) said that the actual saving from being able to operate in wet and rainy weather when previously it was impossible, and in eliminating trouble caused by few clay seams, more than made up for the cost of washing. He said that his plant might be better situated to do washing than some other quarry plants, however.

This plant uses the scrubber system of washing, a rotary screen with jacket of ¼-in. perforations. An improved system, however, is being installed, and the screening will be preceded by a scrubbing drum or barrel with a ring or vane provided to hold the stone in the scrubber longer than it is now possible to hold it in the screen.

The system to be developed, as described by Mr. Owens, will consist of a partially closed-end scrubber, the screen where the material will be further washed by sprinklers, and a third screen section where the stone will be dewatered. It is proposed to build this piece of equipment in one cylinder 18 to 20 ft. long with the washing done in the upper half. He said that the washing and screening system should be designed to meet the worst possible conditions encountered, and then under ordinary operating conditions, practically a perfect stone would result.

Mr. Owens stressed the fact that each installation was more or less an individual problem. In his own case he had found that the original washing screens had been inclined at too great an angle. The amount of water required in this operation he had found was not so much as required for washing an equal amount of sand and gravel. They figured on 600 gal. per min. for 1000 tons of stone a day. He said that he did not consider that vibrating screens with sprinklers would do a satisfactory job in some instances due to the blanking of the screen with flat pieces.

Mr. Owens said further that washing required lots of bin storage, but that on the whole it offered no particular difficulties and also gave the company an excellent selling argument.

Another subject discussed was closer relations with the state highway department in general in order to remove any causes of misunderstanding, particularly in the interpretation of specifications.

National Association Activities

A. T. Goldbeck described in some detail the research work now under way in the laboratory of the National Crushed Stone Association at Washington, D. C. This work is divided under three general heads, (1) crushed stone sand; (2) low cost road types, and (2) railway ballast. The last two involved the building and installation of special equipment with which much new engineering data is expected to be developed.

A. L. Worthen, president of the National Crushed Stone Association (Connecticut Quarries Co., Inc., New Haven, Conn.) was present as an honored guest and spoke on the needs of the national association and of the very tangible results from the research work already done.

Paul B. Reinhold, chairman of the research advisory committee of the National Crushed Stone Association (P. B. Reinhold Co., Pittsburgh, Penn.) was also present as another honored guest and described the organization of his committee, which is made up of 17 sub-committees, each of which is particularly interested in some phase of research or some special product. Many of the members of the association were present at the annual dinner of the Manufacturers Division of the National Crushed Stone Association which was held in the evening of the same day.

Registration

Registration of the meeting is as follows:

Andrews, W. M.; Lake Erie Limestone Co., Pittsburgh, Penn.
Anfinsen, C. B.; Asphalt Equipment Co., Philadelphia, Penn.
Babcock, B. R.; Callanan Road Improvement Co., South Bethlehem, N. Y.
Barab, John; Hercules Powder Co., Wilmington, Del.
Bassett, L. A.; Hendrick Manufacturing Co., Carbondale, Penn.
Borrman, Wm. F.; Borrman Stone Products, Inc., Norwood, N. Y.
Callanan, J. R.; Callanan Road Improvement Co., Albany, N. Y.
Chesnut, D. Lee; General Electric Co., Trenton, N. J.
Davison, H. M.; Harnischfeger Corp., Milwaukee, Wis.
Deverell, Harry; Webster Manufacturing Co., Chicago, Ill.
Earnshaw, F. O.; Carbon Limestone Co., Youngstown, Ohio.
Gill, Fred A.; Gill Rock Drill Co., Lebanon, Penn.
Goldbeck, A. T.; National Crushed Stone Association, Washington, D. C.
Graves, O. M.; General Crushed Stone Co., Easton, Penn.
Gucker, F. T.; J. T. Dyer Co., Norristown, Penn.
Heimlich, J. L.; LeRoy Lime and Crushed Stone Corp., LeRoy, N. Y.
Hopkins, H. E.; *Pit and Quarry*, New York City.
McKee, W. Wesley; Link-Belt Co., Philadelphia, Penn.
McNabb, H. M.; Federal Crushed Stone Co., Buffalo, N. Y.
Merchant, G. E.; LeRoy Lime and Crushed Stone Co., LeRoy, N. Y.
Murdock, R. M.; Manganese Steel Forge Co., Philadelphia, Penn.
Odenbach, John H.; Dolomite Stone Products Co., Rochester, N. Y.
Owens, A. S.; Eastern Rock Products, Inc., Utica, N. Y.
Owens, F. C.; General Crushed Stone Co., Syracuse, N. Y.
Pemberton, E. L.; Frog Switch Manufacturing Co., Carlisle, Penn.
Pollitz, H. C.; Iowa Manufacturing Co., Cedar Rapids, Iowa.
Rainer, H. E.; Federal Crushed Stone Co., Buffalo, N. Y.
Reinhold, P. B.; P. B. Reinhold and Co., Pittsburgh, Penn.
Rice, John, Sr.; General Crushed Stone Co., Easton, Penn.
Robins, S. D.; Robins Conveying Belt Co., New York City.

Rockwood, Nathan C.; ROCK PRODUCTS, Chicago, Ill.
Russell, H. J.; Jointa Lime Co., Glens Falls, N.Y.
Ryan, James; Ryan Quarries, Albion, N. Y.
Saxton, B. S.; Iowa Manufacturing Co., Cambridge, Mass.
Schaefer, George E.; General Crushed Stone Co., Rochester, N. Y.
Schmidt, F. W.; New Jersey Quarry Co., Morristown, N. J.
Schnell, Wm. A.; Link-Belt Co., New York City.
Shotton, Bruce; Hendrick Manufacturing Co., Pittsburgh, Penn.
Sporborg, W. L.; General Crushed Stone Co., Syracuse, N. Y.
Stearns, Sheldon; LeRoy Lime and Crushed Stone Co., LeRoy, N. Y.
Strube, H. L.; Link-Belt Co., Philadelphia, Penn.
Winship, E. E.; Lovinis Machinery Co., Tiffin, Ohio.
Wolf, Edwin T.; E. I. du Pont de Nemours and Co., Wilmington, Del.
Worthen, A. L.; Connecticut Quarries Co., Inc., New Haven, Conn.

Large Winter Bridge Construction Program in Ohio

CONCTRUCTION of 350 necessary bridges this winter at a cost of $3,500,000 is Ohio's answer to the unemployment problem, according to O. W. Merrell, director of highways. Bridge construction is particularly suitable during a period of unemployment, he points out, because "labor receives a greater share of the bridge-building dollar than for other highway activities in which machinery performs much of the work."

The program is planned in cooperation with the state relief committee and a list of unemployed will be furnished the contractor by a committee in each community.

Most of the bridges will be of concrete. Surveys are under way and it is planned to let the 350 bridges in November and December.

Organize Ready-Mixed Concrete Company in Dayton, Ohio

ORGANIZATION of the Ready Mixed Corp. of Dayton, Ohio, which will furnish ready mixed concrete to construction operations, was announced October 30 by Alfred W. Kimmel, president of the new firm.

The company contemplates being ready to deliver ready-mixed concrete by December 1.

The enterprise is a new one to this community and the launching of it at this time is definite evidence of Mr. Kimmel's belief in the solidity of the business conditions in his home community.—*Dayton* (Ohio) *Herald.*

Improvements in Rapid Filter Design

A BRIEF DISCUSSION of present practice in rapid sand filtration in England was recently given by Robert S. Weston. The trend is to depend more and more on the gravel layers for distribution of wash water, and to employ coarser sand and higher rates of filtration. Sand of 0.55 mm. effective size is being successfully employed at several plants, Mr. Weston reported.—*Chemical Abstracts.*

Annual Meeting of Manufacturers Division of National Crushed Stone Association

FOLLOWING its usual custom, the Manufacturers Division of the National Crushed Stone Association held its annual dinner at the New Yorker Hotel, New York City, on October 23.

In addition to a very enjoyable dinner, brief addresses on various phases of the history, progress and future of the division were made by Chairman B. G. Shotton (Hendrick Manufacturing Co., Pittsburgh, Penn.), past-chairmen, M. B. Garber (Thew Shovel Co., Lorain, Ohio), and H. M. Davison (Harnischfeger Corp., Milwaukee, Wis.), A. L. Worthen, president of the National Crushed Stone Association, Otho M. Graves, past-president of the national association, and various others. The chief subjects of discussion were plans for the exhibit at Pittsburgh; and judging by the attendance at this meeting and the enthusiasm, the 1932 convention and exhibit will be as good or better than any previous one.

Registration—Associate Members

F. L. Ahlgren; Atlas Powder Co., Wilmington, Del.
C. B. Andrews; Taylor-Wharton Iron and Steel Co., High Bridge, N. J.
J. Barab; Hercules Powder Co., Wilmington, Del.
L. A. Bassett; Hendrick Manufacturing Co., Carbondale, Penn.
C. C. Bawden; Westinghouse Electric and Manufacturing Co., New York City.
Gordon Buchanan; C. G. Buchanan Co., Inc., New York City.
Edward M. Buck; *Pit and Quarry*, Chicago, Ill.
J. S. Burton; Burton Explosives, Inc., Cleveland, Ohio.
M. S. Cheney; the Thew Shovel Co., Lorain, Ohio.
D. Lee Chesnut; General Electric Co., Trenton, N. J.
D. A. Cheyette; Traylor Engineering and Manufacturing Co., New York City.
R. W. Conant; Bucyrus-Erie Co., New York City.
H. M. Cooper; Sauerman Bros., Inc., Chicago, Ill.
Irving K. Cox; Allis-Chalmers Manufacturing Co., New York City.
J. B. Crew; Marion Steam Shovel Co., New York City.
B. G. Dann; Hendrick Manufacturing Co., New York City.
H. M. Davison; Harnischfeger Sales Corp., Milwaukee, Wis.
Frank Edmondsen; Marion Steam Shovel Co., Albany, N. Y.
W. E. Farrell; Easton Car and Construction Co., Easton, Penn.
T. E. Fisher; Allis-Chalmers Manufacturing Co., Milwaukee, Wis.
Geo. W. Flounders; New York City.
M. B. Garber; the Thew Shovel Co., Lorain, Ohio.
Fred A. Gill; Armstrong Manufacturing Co., Waterloo, Ia., and Gill Rock Drill Co., Lebanon, Penn.
Thos. F. Henson; the Thew Shovel Co., Lorain, Ohio.
Harry E. Hopkins; *Pit and Quarry*, New York City.
L. D. Hudson; Nordberg Manufacturing Co. Milwaukee, Wis.
L. D. Hudson, Jr.; Nordberg Manufacturing Co., New York City.
M. J. Kaiser; Burton Explosives, Inc., Cleveland, Ohio.
George H. Keppel; C. G. Buchanan Co., Inc., New York City.
P. J. Kimball; E. I. du Pont de Nemours and Co., Wilmington, Del.
H. F. Lawrence; the W. S. Tyler Co., Cleveland, Ohio.
Frank J. Long; Earle C. Bacon, Inc., New York City.
W. C. MacEwen; Allis-Chalmers Manufacturing Co., New York City.
L. E. MacFadyn; Taylor Wharton Iron and Steel Co., Easton, Pa.
W. Wesley McKee; Link-Belt Co., Philadelphia, Penn.
W. H. Milroy; Earle C. Bacon, Inc., New Haven, Conn.
J. W. Morrissey; Earle C. Bacon, Inc., New York City.
T. J. Morrissey; Earle C. Bacon, Inc., New York City.
R. M. Murdock; Frog, Switch and Manufacturing Co., and Manganese Steel Forge Co., Philadelphia, Penn.
W. S. Nicol; Cross Engineering Co., Carbondale, Penn.
E. H. Paull; ROCK PRODUCTS, Chicago, Ill.
E. L. Pemberton; Frog, Switch and Manufacturing Co., and Manganese Steel Forge Co., Philadelphia, Penn.
Wm. H. Quinn; Chain Belt Co., Cleveland, Ohio.
W. Vincent Pietsch; Earle C. Bacon, Inc., New York City.
A. W. Randle; *Pit and Quarry*, Chicago, Ill.
F. O. Reedy; Kennedy-Van Saun Manufacturing and Engineering Co., New York City.
J. H. Robins; Robins Conveying Belt Co., New York City.
Nathan C. Rockwood; ROCK PRODUCTS, Chicago, Ill.
H. C. Ryder; the Hayward Co., New York City.
R. E. Savage; the Thew Shovel Co., Lorain, Ohio.
Wm. A. Schnell; Link-Belt Co., Chicago, Ill.
R. R. Shafter; Traylor Engineering and Manufacturing Co., Allentown, Penn.
Bruce G. Shotton; Hendrick Manufacturing Co., Pittsburgh, Penn.
L. W. Shugg; General Electric Co., Schenectady, N. Y.
G. E. Stoltz; Westinghouse Electric and Manufacturing Co., East Pittsburgh, Penn.
H. L. Strube; Link-Belt Co., Chicago, Ill.
P. C. Tennant; Texas Co., New York City.
Frank B. Ungar; Ludlow-Saylor Wire Co., St. Louis, Mo.
Franklin P. Waller; Harnischfeger Corp., Milwaukee, Wis.
Ed. Webster; Ross Screen and Feeder Co., New York City.
Norman O. Weil; the W. S. Tyler Co., Cleveland, Ohio.
Fred S. Wells; Stephens-Adamson Manufacturing Co., New York City.
W. N. Westland; Marion Steam Shovel Co., Marion, Ohio.
E. E. Winship; Loomis Machine Co., Tiffin, Ohio.
Edwin T. Wolf; E. I. du Pont de Nemours and Co., Narberth, Penn.
S. R. Russell; E. I. du Pont de Nemours and Co., Wilmington, Del.

Others Present

F. L. Andrews; William Penn Hotel, Pittsburgh, Penn.
Wm. M. Andrews; Lake Erie Limestone Co., Youngstown, Ohio.
B. R. Babcock; Callanan Road Improvement Co., South Bethlehem, N. Y.
Wm. F. Barrman; Barrman Stone Products, Inc., Norwood, N. Y.
J. R. Boyd; National Crushed Stone Association, Washington, D. C.
J. R. Callanan; Callanan Road Improvement Co., South Bethlehem, N. Y.
F. O. Earnshaw; Carbon Limestone Co., Youngstown, Ohio.
A. T. Goldbeck; National Crushed Stone Association, Washington, D. C.
O. M. Graves; General Crushed Stone Co., Easton, Penn.
F. T. Gucker; John T. Dyer Quarry Co., Norristown, Penn.
Bernard A. McKinney; West Roxbury Trap Rock Co., Boston, Mass.
A. S. Owens; Eastern Rock Products, Inc., Utica, N. Y.
P. B. Reinhold; Reinhold and Co., Pittsburgh, Penn.
John Rice; General Crushed Stone Co., Easton, Penn.
Geo. E. Schaefer; General Crushed Stone Co., Rochester, N. Y.
F. W. Schmidt; Buffalo Crushed Stone Co., Buffalo, N. Y.
John H. Schmidt; North Jersey Quarry Co., Morristown, N. J.
W. L. Sporborg; General Crushed Stone Co., Syracuse, N. Y.
A. L. Worthen; Connecticut Quarries Co., Inc., New Haven, Conn.

To Use City Power During Shut-Down

THE Lehigh Portland Cement Co. has arranged with the Oglesby, Ill., city administration to supply power at 3.75c per kw.h., with the possibility that the rate may be reduced to 3.5c December 1, the *La Salle* (Ill.) *Post* reports.

This arrangement is to apply while the plant is shut down.

Cement Products

TRADE MARK REGISTERED WITH U. S. PATENT OFFICE

Nine Years' Experience Goes Into This Ready-Mix Plant

Auxiliary Equipment Insures Production in Modern Plant of Fort Worth Sand and Gravel Co.'s Ready-Mixed Concrete Plant

By Craig Laine
Fort Worth, Texas

THE MANUFACTURE and transportation of concrete made in central mixing plants present problems peculiar to the industry. Aggregates require a large amount of storage space; the material handling equipment must be sturdy to avoid breakdowns; the processing units must be foolproof; the materials must be combined in proper proportions; and, finally, the batch must be transported without any loss of workability or strength.

The Fort Worth Sand and Gravel Co., Fort Worth, Tex., was familiar with these problems by reason of its operation over a period of nine years of what was probably the first commercial ready-mixed concrete plant west of the Mississippi river, and perhaps the second or third in the United States. That plant is now dismantled, but the experience gained with it was used in designing the present modern plant. The new plant, which is located just east of the downtown section at Sixth and Terry street and is one block north of the old plant, was put into operation April 20, 1931.

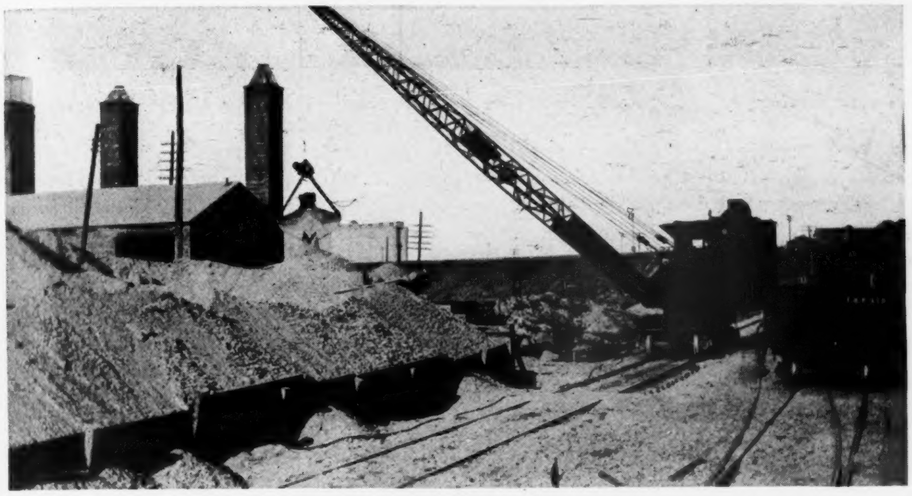
It is laid out for a straight-line production from east to west and is arranged so that

General view of plant showing concrete mixing unit in center and dry batching bin beyond at right

trucks may be loaded with either dry batched aggregates or premixed concrete. Raw materials from the company's sand and gravel plant at Hart Spur, a few miles east of the city, are brought in to the plant over the Rock Island railroad.

Raw Material Handling

The various sizes of sand and gravel are unloaded from railroad cars to open storage by an Industrial Brownhoist locomotive crane. This is equipped with a 60-ft. boom and a 1¼-yd. Brownhoist clamshell bucket and is fired with fuel oil which is pumped from an underground storage tank of one car capacity to the crane by a 2-hp. Gould centrifugal pump.



Unloading aggregates from cars to storage

The sizes handled in the open storage include pit-run gravel, 1½-in. gravel, ¾-in. gravel, roofing gravel, concrete sand and brick sand.

Below the storage pile is a 7-ft. by 7-ft. reinforced-concrete tunnel 300 ft. long, in which is a reclaiming belt conveyor 24 in. wide by 300 ft. long. This conveyor is made up of Barber-Green roller bearing idlers with a 24-in. Goodyear style B belt and is driven by a 10-hp. Howell motor. It is reversible so that unreclaimable material, such as spillage and sacking from the gondolas, may be dumped at the eastern end of the tunnel.

The roof of the tunnel has 36 Weller gates from which the materials are drawn on to the belt by means of 12 portable loading chutes. The reclaiming system has a rated capacity of 200 yd. per hour.

Two electric auto horns, placed near each end of the tunnel and operated from the control room in the mixing tower, are used to signal to the operator in the tunnel the kind of material wanted and when it is to be stopped. One "honk" is the signal to stop, and others are used to indicate different materials.

The tunnel conveyor discharges to a second belt conveyor which is inclined at an angle of 15 deg. and carries up past the concrete mixing plant to a point above the dry batching bin. Here, by means of a gate, the material may be dropped into the bin or diverted to a third belt conveyor, also inclined at an agle of 15 deg., which carries back to the top of the concrete mixing plant.

The second inclined conveyor is 24 in. wide by 168 ft. long on centers and is driven by a 20-hp. Howell motor. The third inclined conveyor is the same width and 78 ft. long on centers and is driven by a 7½-hp. Howell motor. Both conveyors are made up of Barber-Greene roller bearing idlers which are supported on 30-in. Barber-Greene steel trusses. This light weight trussed construction requires only two intermediate supports for the long conveyor and none for the short conveyor. The second conveyor has a 24-in. Marco belt furnished by the Mechanical Rubber Co. and the third a 24-in. Stoneore belt furnished by the New York Rubber Co.

At the dry batching bin a turngate permits of putting any material from the conveyor into any one of its six compartments. The bin has a total capacity of 450 tons and is arranged with a single compartment batcher so that any material may be loaded to trucks. Later it is intended to install a weighing batcher. Levers for the various gates are located so that they can be conveniently operated from a platform 12 ft. above the ground.

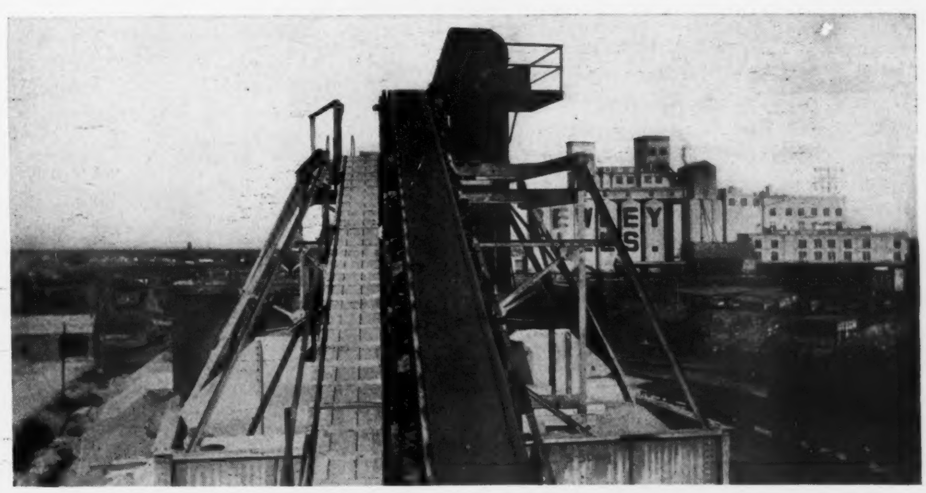
Material Handling at Mixing Plant

At the concrete mixing plant a turngate at the end of the belt conveyor permits the various aggregates to be put into any one of the five aggregate compartments of the 300-cu. yd. capacity Heltzel steel bin above the mixers.

Cement is received at the plant in bulk in carload lots which are unloaded by a power scraper and the cement carried to overhead bins by an elevator. The scraper is operated by means of an automatic winch which is driven by a 5-hp. Howell motor through a Link-Belt speed reducer and discharges to the boot of a Link-Belt vertical bucket elevator alongside the track. This elevator discharges to either of the two cement compartments which are a part of the Heltzel steel bin. Each compartment holds about 450 bbl. of cement.

The steel cased elevator is equipped with a ladder with circular guards and is driven by a 10-hp. Howell motor located on a platform at the top. An auxiliary Weller belt conveyor or man lift type of elevator driven by a 3-hp. Howell motor is available in case of emergency to carry sacked cement to the weighing floor where it can be stored.

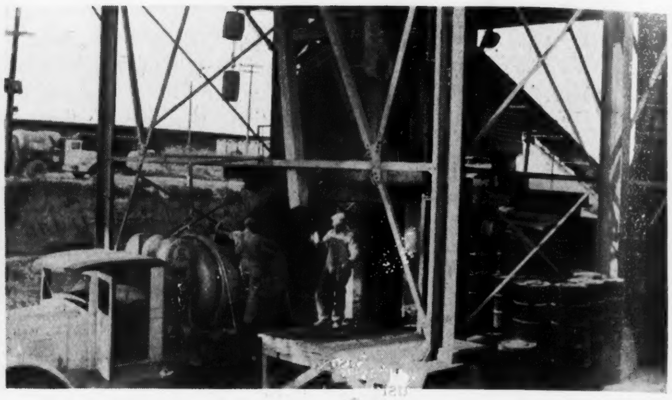
Sand and gravel are drawn from the bin compartments by means of manually operated gates into a two-compartment Heltzel weighing "Agrabatcher" equipped with Kron automatic springless scales of 10,000 lb. capacity. The sand requirement is fed into one compartment and the gravel into the other.



Top of concrete mixing plant showing conveyor for aggregates and cement elevator

The cement is fed by gravity through gates into another Heltzel weighing Agrabatcher of 2000-lb. capacity. It was found necessary to introduce compressed air under 40 lb. pressure into the cement storage compartments immediately above the gates to prevent bridging of the openings, air for this

View of storage yard and tracks from top of mixing plant



Agitator truck being loaded. Delivery ticket is received through chute

purpose being furnished by a Curtis air compressor driven by a 2-hp. motor.

These materials are then allowed to feed through gates into a hopper and from it through a chute into the 2-yd. Jaeger mixer which is driven by a 40-hp. General Electric motor.

Water is added to the mix by means of a home-made siphon type of water measuring tank of 85 gal. capacity. The control valve of this is set on a calibrated arc, and automatically permits only the desired amount of water to enter the mixer.

The concrete is generally held in the mixer about one minute and then discharged by gravity through a chute with hooded spout in which is set a swing gate to shut off drippings.

A 1½-yd. Ransome mixer from the old plant is also mounted back of the Jaeger mixer and is held in reserve for emergencies. In addition, dry materials can be fed direct to the mixing trucks through another Heltzel batcher located between the two mixers. The 2-yd. Jaeger mixer is further equipped with two sets of clutches for the discharging mechanism, so that, here again, the plant is guarded against possible breakdowns.

Although the equipment has not yet been operated at full capacity, it has turned out 240 yd. of ready mixed concrete in 3 hr. and in the opinion of the operators would turn out 100 yd. per hr. Its present output is limited by the number of trucks in use.

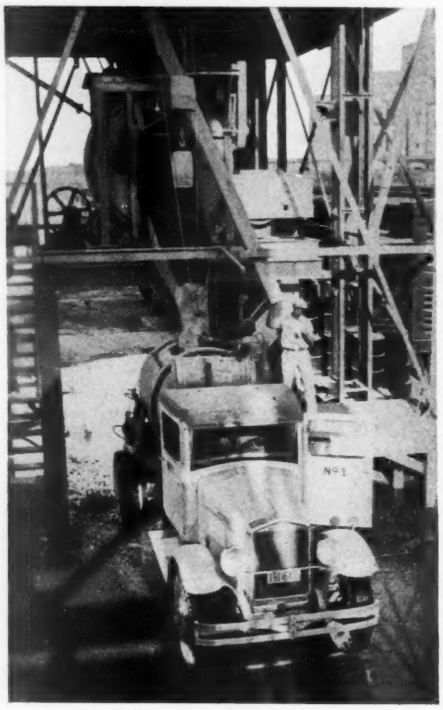
Truck Delivery

Ten Jaeger truck mixers of 2-yd. capacity mounted on Brockway-Indiana trucks are used for deliveries. The revolving drums of these mixers are driven by a Fuller-Johnson gasoline engine placed behind the driver's cab.

Each truck has a water tank above the engine which carries water used for washing out the drum on each return trip. After each fourth trip a high pressure water jet is also used by the driver to remove any accumulations and to thoroughly clean the mixer.

In order to further encourage cleanliness the management gives a prize of $2 each week to the driver whose truck has been kept the cleanest during the week. Cleanliness and neatness are encouraged throughout and the visitor is impressed by the spick-and-span appearance of the plant and equipment.

The plant office is a two-story concrete tile structure with the drivers' room below and



Mixer discharging to agitator truck

the office and superintendent's desk above. Orders are received over the phone from the main downtown office and written on a Standard electrically operated autographic register. Delivery tickets are also written on the same machine. One copy of the batch order and two copies of the delivery ticket are fastened to a spring clamp on the carrying mechanism of a Lamson wire conveyor of the kind used in department stores and sent over to the operator on the mixing floor.

The delivery tickets are then lowered to the driver through a wooden chute which has its lower opening near the truck loading point. When required, an International time stamp, showing hour and minute, is used to stamp orders for concrete delivered in flat bottomed trucks, so that the elapsed time between mixing and delivery may be accurately determined. At the plant office a wooden chute runs from beside the clerk's desk to just inside the door of the first floor, where the drivers who are delivering material from the dry storage bins get their copies. T. E. Popplewell, who is treasurer of the Fort Worth Sand and Gravel Co., is manager of this department of the business. J. J. Randol is plant superintendent. The offices of the company are at 1105 Fair building, Fort Worth, Tex.

Governor Cites Relief Benefits of Public Works Construction

THE PARAMOUNT NEED of locating jobs for the unemployed was stressed recently by Governor Larson of New Jersey who does not favor leaving the entire burden of relief to public charity.

The governor pointed to the large public works program of New Jersey as an example of the steps which can and are being taken to provide employment. He said, "Highway and building authorities estimate that fully 75% of the money spent in construction is paid in wages to someone along the line, either in actual building or in supplying materials. Relief money devoted to improvements will go almost as far as that expended in direct charity, and it will bring lasting benefits.

"There is enough needed construction pending on national, state, county and municipal projects," he went on, "to meet adequately the demands of the present emergency, if steps will be taken to get the work under way. Over six billion dollars in contemplated improvements has been reported to the President's committee on employment since last November. Yet only about one-third has reached the construction stage. At least half of the remainder could be brought to contract almost immediately by determined action on the part of officials."

High Temperature Insulation

The Laws of Heat Transmission Explained

By Waldo Hutchinson

DURING THE PAST few years the demand for greater capacity and higher efficiency has brought about the use of much higher temperatures in industrial processes. The steaming capacity of a boiler, the melting time in a metallurgical furnace, the output of a portland cement kiln—are all influenced greatly by the temperatures employed in the operation. Small increases in the operating temperature often mean considerable increases in the capacity of the equipment and consequently refractories are used to the limit of their endurance. Refractories have been improved and new types of refractories have been developed to keep pace with these higher temperatures. In many cases, however, the heat-resisting properties of available refractories are still the limiting factor and it is safe to assume that as more refractory materials are developed temperatures will be still further increased.

Heat flow through the refractory walls of furnaces and other heated equipment carries a considerable part of the heat to the outside surface, from which it is lost into the atmosphere by radiation and convection. The use of these higher temperatures in industrial processes would have increased the heat losses greatly were it not for the development and use of heat insulating materials.

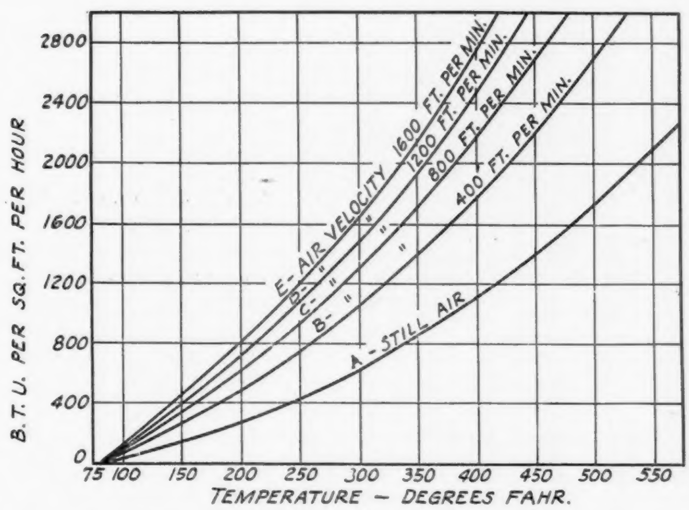


Fig. 1. Heat loss from surfaces at various temperatures and air velocities

The Basic Idea of Insulation

In the loss of heat from a furnace wall there is involved first the tranmission by conduction through the wall to the outer surface; and, second, the giving out of the heat from the outer surface to the air by radiation, enhanced by convection due to air movement on the outside of the wall. No more heat can be transmitted through the wall at equilibrium than is emitted by the outer surface of the wall.

The quantity of heat transmitted by conduction through the wall varies directly with the area of the wall, the temperature difference between the inner and outer surfaces of the wall, the thermal conductivity of the materials of which the wall is composed and inversely with the thickness of the wall.

The rate of emission of heat from the cooler surface depends upon various factors —mainly, upon the surface temperature, the temperature difference between the wall and the adjacent air, the rate of circulation of air and in lesser degree upon the nature of the surface of the wall; its color, position, degree of smoothness and material of construction.

Numerous investigators have published equations covering combined radiation and convection from heated surfaces at varying temperatures to air at a constant temperature. The curves shown in Fig. 1 are based on the equations of Langmuir. Tests made at the research laboratory of the Celite Products Co. indicate that these curves may be used for any ordinary surfaces, such as steel plate, fire brick, red brick or insulation. The position of the surface has not sufficient effect to make it necessary to take this into consideration for ordinary purposes and the curves may be used for either horizontal or vertical surfaces.

Radiation losses rise rapidly with rise in temperature and it is consequently increasingly important to reduce heat losses at the higher temperatures. For instance, curve *A* in Fig. 1 indicates that a furnace wall at a temperature of 200 deg. F. under still air conditions will dissipate 270 B.t.u. per square foot per hour, while at 400 deg F. the loss will be 1100 B.t.u., or more than four times as great.

The air velocity on the outside of a wall also has a marked effect on the amount of heat which will be lost from the wall at any given outside temperature. The effect of air velocity is to decrease the thickness, and consequently the resistance, of the air film on the outside of the wall, and the outside surface temperature will be correspondingly reduced. But as the heat flow by conduction through the wall increases in approximately direct proportion to the temperature difference between inner and outer surfaces, a wall exposed to moving air, while it will be at a lower temperature than if the air were still, will actually be losing a greater amount of heat.

The effect of the air velocity on heat transfer from the surface to the air at various outside surface temperatures is shown in curves *B, C, D* and *E* on Fig. 1, all of which are based on Langmuir's equations. For instance, a furnace casing at an outside surface temperature of 400 deg. F. under still air conditions (curve *A*) will lost 1100 B.t.u. per sq. ft. per hr., while with an air velocity of 400 ft. per min., corresponding to a wind of 4.5 miles per hour (curve *B*), a casing at the same temperature will lost 1760 B.t.u. per sq. ft. per hr., an increase of 60% At higher air velocities the difference is correspondingly greater.

For equipment inside a building still air may be assumed in most cases and the heat loss in B.t.u.'s may be determined by measuring the exterior temperature and referring to the chart. Where the equipment is located out of doors, however, correct results will not be secured unless wind velocity is measured and taken into consideration.

Air Space Not an Insulator at High Temperatures

For some time there was a general belief that since air is a poor conductor of heat, air spaces built into the walls of boilers, furnaces, etc., would prevent or reduce heat loss through the walls. Messrs. Ray and Kreisinger of the United States Bureau of Mines ran a series of exhaustive tests on air spaces used as an insulation and showed that this belief does not hold true at high temperatures because of the fact that the hot surfaces of the air space radiate heat so rapidly that a greater amount is lost across the space by radiation than would be conducted were the air space filled with material of relatively high conductivity such as fire brick. The

reason for this is that the quantity of heat passing through a portion of a solid wall by conduction depends upon the difference between the temperatures of the two planes limiting the portion of the wall; while the quantity of heat that passes across the air space in the wall is proportioned to the difference between the fourth powers of the absolute temperatures of the surfaces inclosing the air space.

Such information is hardly necessary, however, to confirm the fallacy of attempted insulation in furnace walls by the use of so-called dead air space. Besides the intense radiation through air at high temperatures, there is also rapid convection. The average velocity of the molecules in air at 1100 deg. F. is approximately 60 miles a minute (this calculation can be made from information to be found in many standard texts on physical chemistry); it might be well, therefore, to use the term "live air space" instead of "dead air space."

For low temperature insulation, such as refrigeration, hollow wall spaces are used to good advantage. Similarly, hollow tile, while satisfactory in ordinary building construction, affords no insulating value at higher temperatures.

Heat Conductivity Through Walls

A good refractory material is essentially strong and dense and is consequently highly conductive. In order to prevent excessive heat loss, a furnace wall must either be built up of great thickness, which is costly, gives an inelastic wall and absorbs a large amount of heat not used in productive work, or be built to include a layer of some material of lower thermal conductivity called the insulator.

The rate of heat flow through a wall depends upon the resistance of the component materials to the passage of heat. Generally speaking, a material having a low apparent density is considered to be a good insulator. Most such materials contain a number of small "voids" or cells containing air. There is danger, however, of having the cells too large and having radiation across the spaces and convection currents within the cells, which increase the conductivity. Roughly speaking, if the cells are large enough to be seen with the naked eye, they are large enough to be instruments of heat transfer by radiation and convection.

The relative thermal conductivities of fire brick, red brick and representative insulating materials are shown in Fig. 2, all conductivities being based upon the mean temperatures of the test specimens. The lines showing the conductivities of red brick and fire brick illustrate the rapid rate of increase as the temperature increases. The fire brick with a minimum conductivity of 6.0 B.t.u. per sq. ft. per hour at 200 deg. F. increases in conductivity to 11.6 B.t.u. at 2600 deg. F. When it is realized that the super-refractories now in quite general use in many high temperature processes have conductivities many times higher than that of fire clay brick, the importance of backing refractory materials with insulation can be readily understood.

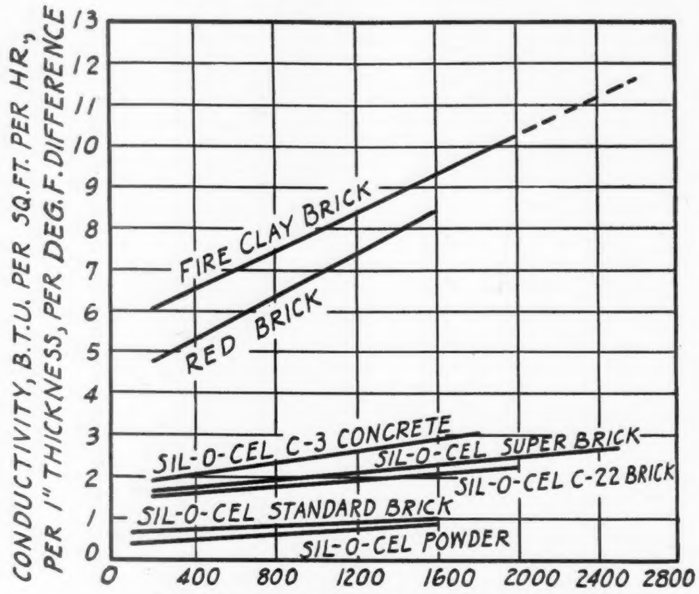


Fig. 2. Relative conductivities of various materials at different temperatures

Naturally, the denser a material is the more conductive it will be. As previously stated, however, the porosity may not be a true index of the conductivity of a material at high temperatures due to the effect of radiation. To be effective as an insulating medium at high temperatures, a material must not only have a high porosity but the individual pores must be microscopic in size, so that heat transfer by radiation within the material will be at a minimum. The larger the individual air spaces or voids within the material the more rapid will be the increase in conductivity as temperature increases.

It will be noted that the insulating brick is on the average about ten times as effective

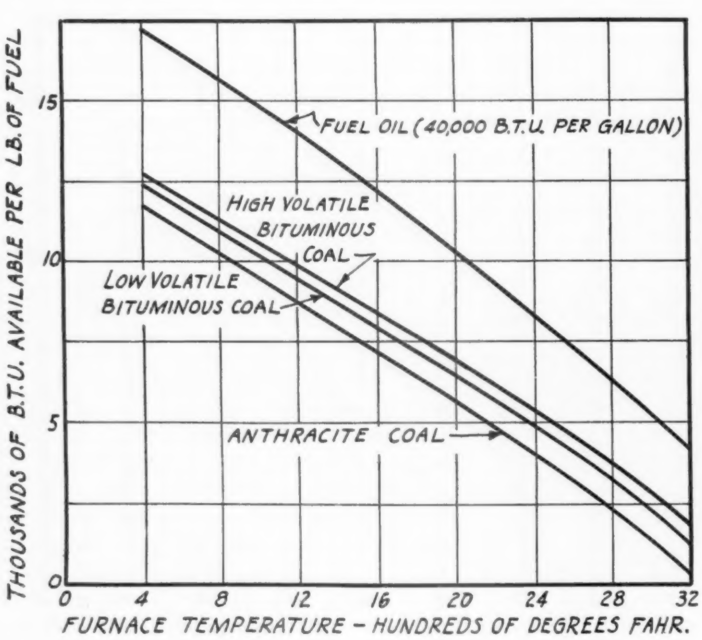


Fig. 3. Relation between furnace temperatures and available B.t.u.'s for various fuels

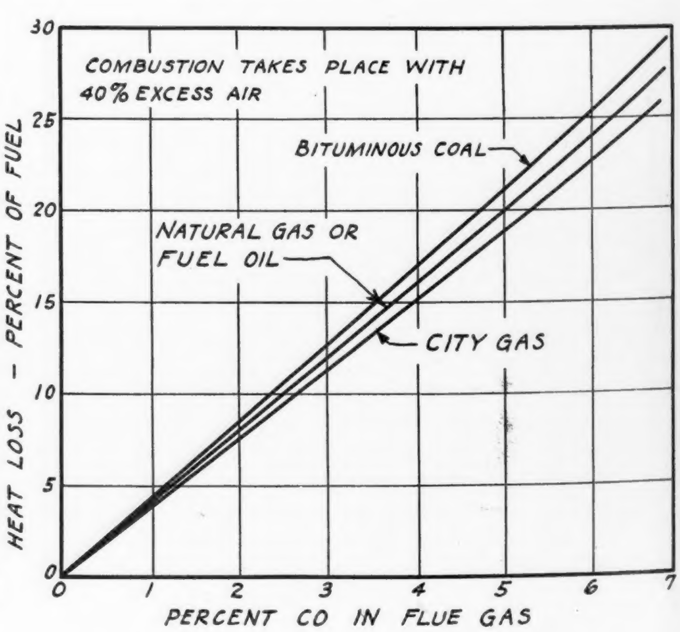


Fig. 4. Fuel losses due to incomplete combustion

as fire clay brick in retarding the passage of heat. The low conductivity of insulating materials prepared from diatomaceous silica is due to the fact that they contain a volume of as much as 85% of infinitesimal air cells which effectively break up the heat waves. The term "infinitesimal" is used advisedly, as it is estimated that there are from 40 to 50 millions of these cells in each cubic inch of the natural mineral, diatomaceous silica. Being practically pure silica (SiO_2), the material has a high melting point, 2930 deg. F., as determined by the U. S. Bureau of Standards. Certain calcined grades can be used where they will be subjected to temperatures as high as 2500 deg. F. in back of the refractory lining. This high degree of refractoriness permits its use as insulating material in practically all types of heated equipment.

While fuel saving is the principal advantage of insulation and the most readily convertible into dollars and cents, there are other attendant advantages which in many classes of work are considered to be at least as important as the saving in fuel. First among these is the improvement in the quality of heat-treated products which is brought about by the more uniform and more accurate temperature control possible with insulated equipment. It is therefore unnecessary to overheat certain portions of the equipment in order to bring the remote parts to the required temperature.

Other advantages of insulation are increased capacity of the equipment, protection to brick work from rapid temperature changes, reduction of internal strains and cracking and an improvement in working conditions around the equipment.

Concrete Roadway on George Washington Bridge

A CONCRETE HIGHWAY, four traffic lanes wide, is now suspended across the Hudson river — a highway which is expected to carry more than eight million vehicles during its first year of operation.

This highway is part of the world's largest and longest suspension bridge, the George Washington Bridge which connects New York and New Jersey.

For the present only four traffic lanes will be used, but four additional lanes of travel, giving four in each direction, will be paved when traffic demands increase.

Best modern practice was used in constructing the pavement. The concrete mixture was designed for a strength of 4,000 lb. per sq. in. at 28 days.

Significance of Specifications for Materials

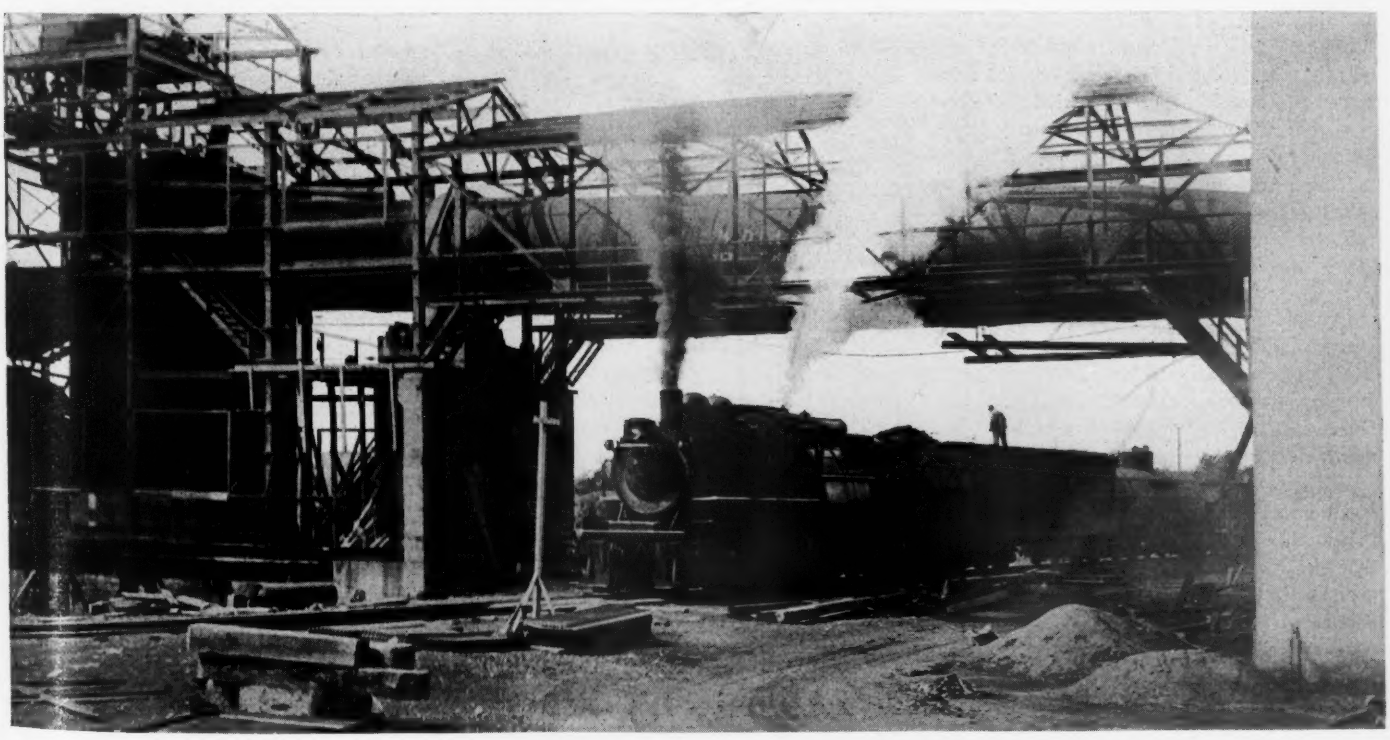
"THE ECONOMIC SIGNIFICANCE of Specifications for Materials" is the title of a booklet published by the American Society for Testing Materials. This publication contains a report of the symposium held under the joint auspices of the American Society for Testing Materials and the Western Society of Engineers during the annual meeting of the American Society in Chicago. Papers presented in this symposium and published in the booklet are "Value of Specifications in the Manufacture of Steel" by John Brunner; "The Economic Significance of Specifications for Materials from the Standpoint of a User of Steel" by P. Parke; "The Economic Significance of Specifications for Materials from the Point of View of a Producer of Concrete" by J. H. P. Perry; "The Use of Specifications for Concrete from the Point of View of the Consumer" by Arthur R. Lord; and "Specifications from the Standpoint of a Large Purchaser of Engineering and Special Materials" by J. W. Bancker. These were followed by a discussion on motor oils by H. C. Mougey.

Rotary Kiln Across Railroad

THE accompanying illustration is an example of the efforts being made by experienced cement mill operators to meet the present depression and low cement prices by the installation of modern equipment to reduce operating costs.

The kiln shown is 382 ft. long and was installed to improve the efficiency of the plant by replacing four 120-ft. kilns. It was placed in operation September 26 and its performance has been entirely satisfactory. It is a Unax kiln which with its appurtenances was furnished by F. L. Smidth and Co. of New York, who also did the engineering on the installation. The installation is at the plant of the Glens Falls Portland Cement Co., Glens Falls, N. Y.

On account of the greater length of the new kiln it extends a considerable distance beyond the old kilns (one of whose stacks is partly visible at the right of the photograph) and crosses a main railroad freight line. The stack and dust chamber of the new kiln had to be built up from the old quarry floor, which is about 40 ft. below grade, showing the difficulties encountered and overcome by operators and engineers when installing new equipment.



New kiln extends above railroad track

Diesel Engine Lubrication

By R. C. Demary

THE LUBRICATION of diesel engines requires more care than steam driven units and improper lubrication of diesel engines will cause more trouble in a shorter space of time. Especially is this true of cylinder lubrication, which seems to be the chief source of trouble.

The average steam engineer makes an excellent diesel engineer but is likely to be weak on the proper methods of lubrication. He could hardly be expected to be otherwise, as there is little written on the subject, and most of that in the interest of some particular brand of oil.

For several years I was an erector and trouble man for one of the largest diesel engine builders in this country and incidentally had considerable experience with diesel engines used in connection with the rock product industries.

In this article I will give briefly some of the results of my experience with diesel engines in the rock products field which may be helpful to the man in charge in solving lubrication problems and avoiding unexpected shut-downs.

We all know that two metal surfaces rubbing together cause friction and to reduce that friction we must use some kind of lubricant. This lubricant or oil must form a film that will entirely separate the two metal surfaces.

A good lubricant must have the following characteristics: (1) it must be capable of forming a film between two surfaces, (2) it must have low friction qualities within itself, (3) it must resist being squeezed from between the metallic surfaces and (4) it must not gum and must be as low as possible in carbon forming ingredients.

There are other qualities which a good lubricant should have but the ones mentioned are the most important.

Causes of Trouble

In most cases of trouble I found excessive carbon and badly gummed parts, the trouble from carbon usually being the chief factor. In many cases the lubricant was at fault and where the engine was used in one of the many rock product industries I found badly fouled air to be a contributing cause of no small importance.

Too much care can not be taken to see that the air used for scavenging and compression is thoroughly cleaned from all dust particles. Many manufacturers equip their engines with an air washer or purifier, though many others give this important item little or no consideration.

I found many cases where the air suction pipe for the engine simply projected through the building and close to rock crushers. With the wind in the right direction large quantities of rock dust were drawn into the pipe. I found other installations where the dust from sand driers was being sucked direct into the engine cylinders. I found excessive carbon very common in engines used in gypsum and cement plants and an analysis showed the carbon to have been formed largely of dust particles.

Some Remedies

One of the first steps in reducing carbon troubles is to secure a source of pure air. In many cases this was done by erecting a framework about the suction pipe and covering it with several thicknesses of cheese cloth. In one case the suction was moved from outside the building to an old sump below the engine floor which had formerly contained the condenser for the steam plant. Air purifiers can be purchased but one can be made on the job and at a very small cost which will answer every purpose.

If an engine runs without giving trouble of any kind we know that it must be well designed and that the proper oil is being used. If trouble does occur we may be sure of one or more possibilities: (1) the oil may be poorly refined; (2) it may not be fed to the cylinders in the right amount or at the right time; (3) it may be a good oil yet not adapted for this particular engine; (4) the system may not be properly designed.

Trouble due to the first cause is frequently encountered, though not often where well known brands of oil are used. The second case depends upon the vigilance of the engineer. In the third case it might be necessary to change oils and use one better adapted to the engine. Trouble due to the last mentioned case is becoming rare though it still exists.

Lubrication conditions are much more severe in the case of diesel engines than with steam units.

A suitable lubricant for a diesel engine must meet three requirements: (1) it must lubricate the piston effectively at a fairly high temperature; (2) it must seal the piston rings to prevent leakage; (3) it must burn without forming too much carbon in the cylinders.

The first requirement is a very important one and depends upon the viscosity, or in other words, the resistance to flow. The higher the viscosity the less fluid the oil, and this property decreases greatly as the temperature is increased. Viscosity is generally expressed as light, medium, or heavy and may vary greatly with different brands of oil. For instance two light oils of different brands may differ greatly in viscosity. Thus we find that the higher the viscosity the thicker the oil but we must not lose sight of the fact that all oils decrease greatly in viscosity on slight increase in temperature.

Temperatures in Diesel Engines

I know many engineers who declare they are using the best oil, yet have lubrication troubles and always would have with a diesel engine because of the extremely high temperatures in the cylinders. Experiments have shown that a maximum temperature of about 2675 deg. F. is obtained at the beginning of the power stroke, or upon ignition of the fuel charge. This temperature is lowered as expansion of the burning charge takes place and gradually goes back to the maximum on the compression stroke. The minimum temperature is about 250 deg. F., with an average of approximately 945 deg. F. during the complete cycle. These are the temperatures of the gases and not of the cylinder walls. There is a great difference between the temperatures of the gases and the cylinder walls and this has an important bearing on cylinder lubrication.

From a series of experiments conducted by W. B. Meriam it was shown that the cylinder walls had a temperature of only about 30 deg. F. above the temperature of the circulating water. Now just as long as the water is not boiling we know that the temperature of the cylinder walls is not higher than 250 deg. F. and that the temperature of the pistons is but a very few degrees above the temperature of the cylinders. Therefore the high temperatures need cause us no great concern.

Action of Heat on Oils

The action of heat on oils is determined by the flash point and the fire point. The flash point is the temperature to which the oil must be heated in order that the vapors given off will make a slight explosion when a flame is held directly over the oil. The fire point is the temperature to which the oil must be heated in order that it will take fire and burn when a flame is applied to it. The fire point is usually from 40 to 50 deg. F. above the flash point.

Practically all oils used in lubricating diesel engines have a flash point above 320 deg. F., and if the temperature rises above that point there must be something wrong, not with the oil, but with the engine. Locate the trouble, and correct it but do not feed more oil or change lubricants.

Lubricating oil does not burn readily, and furthermore the time given it in the cylinder is very short. An engine running at only

100 revolutions per minute would expose the lubricated surface of the cylinder to the action of the flame for less than one-quarter of a second. At higher speeds the time allowed for the oil to burn is so short that a flash point of 300 deg. F. would be sufficiently high for any diesel engine except under the most unusual conditions.

Carbon Causes Most Trouble

The chief trouble maker in connection with the operation of diesel engines is carbon deposits in the cylinders. The lubricating oil of course is blamed for this and the blame may not be unwarranted but in nine cases out of ten the operator is at fault and a little more care and reasoning on his part would eliminate this. Carbon exists in two forms: first, fine carbon suspended in the fuel and lubricating oils; and second, in combinations forming hydrocarbon compounds which go to make up the oil. The amount of fine carbon is very small and the trouble from that source should hardly be considered but must be due to some other factor, such as dust.

With the fuel so regulated as to give a clear exhaust and by using only sufficient lubricating oil to lubricate the cylinders carbon troubles will be reduced to a minimum. In nearly every case that I was called on I found the engineer using far more oil than necessary for proper lubrication. An overlubricated cylinder will always cause trouble from carbon. I found that the addition of a small amount of graphite (about two tablespoonfuls per gallon of oil) would aid greatly in lubricating cylinders and a marked decrease in the amount of carbon was noticed. Not only that but the carbon which had been formed was easily removed. The amount of oil necessary of course depends on the engine and the conditions under which it is operated.

Just which kind of oil is best adapted for diesel lubrication has formed the basis for many a heated discussion. Some engineers would use only the eastern crude oils with a paraffine base while others prefer the western oils having an asphalt base. I have tried both kinds under nearly every condition and from actual experience have found that the oils having an asphalt base give the best satisfaction. The claim that these form more carbon than the oils with a paraffine base I have not found true. Not only that but what carbon is formed is of a softer texture and much easier to remove.

Those oils having a paraffine base such as the Pennsylvania crudes have, as a rule, a much lower viscosity and to compensate for this it is necessary to resort to compounding. The light oils are mixed with the heavier cylinder oils, and the latter is responsible for most of the gumming and carbon troubles experienced.

The asphalt base oils are composed chiefly of the ethylene and the napthene series and distill without decomposition.

The color of an oil, regardless of what the manufacturers claim, has no relation to its lubricating value. You can, however, tell if the oil is compounded with cylinder stock as the greenish tinge of the latter will always show.

The following are a few simple tests which can be made by any engineer and will aid him in securing proper oils.

Place a few drops of oil on a piece of glass and evaporate it slowly over a small smokeless flame. The residue remaining on the glass will indicate the amount of gummy material in the oil.

One thing we must be sure of in diesel engine lubrication and that is that the oil is free from sulphuric acid. An easy test is to take about four ounces of oil and place it in a bottle or jar and add about one ounce of warm water. Shake the bottle for a few minutes or until all the oil has been thoroughly washed, then allow it to stand until the oil and water have separated. Drain off the oil and test the water with a piece of neutral litmus paper. If the paper shows a slight reddish tinge it indicates the presence of acid and the oil should be rejected at once as it is not suitable for cylinder and valve lubrication.

To determine the base place a small amount of oil on a piece of white paper. If after evaporation the paper remains clear or retains its original color the oil has a paraffin base. If a dark stain appears on the paper the oil has an asphalt base.

Efficient Lubrication

While practically every diesel engine is equipped with a force feed lubricator I find many of them are of little value. To secure proper cylinder lubrication the oil must be applied at just the right time. There are many lubricators on the market that are especially adapted for this work. They should be so driven and timed that the piston of the lubricator pump works in synchronism with the piston of the engine. The oil should be delivered directly on to the piston, between the rings and at the end of the stroke. Now if we stop to consider a moment we will see how important such a method is. The oil that does not strike the piston or is forced into the cylinder at such a time as the oil hole is uncovered by the piston is wasted and means just so much more carbon forming material. With a lubricator of this type the amount of oil may be materially reduced. If on removing a cylinder head or withdrawing a piston there is a film of oil of sufficient thickness to penetrate two thicknesses of cigarette paper then a sufficient amount of oil is being used.

In some cases lubricators are divided into two compartments so that one grade of oil can be used on the cylinders and another on the other bearings. This has been the cause of much trouble because of making a mistake in the oils. Furthermore, the small saving in the cost of oil does not warrant this method. Do not try to save on oil at the expense of the engine, yet keep in mind that too much oil may likewise cause trouble.

Correct Viscosity

Beware of whom you buy your oils and be sure they contain no animal fats. Under ordinary conditions an oil with a viscosity of not less than 200 at 100 deg. F. and a low cold test is found to give the best results. Sometimes, however, operating conditions are very severe and the rings may be leaking. Under these conditions an oil with a viscosity of 450 or 500 may be necessary.

Remember the color of an oil means nothing, neither does the density as a specific property, for when we mention light, heavy or medium we are concerned only as to viscosity. Light means low viscosity and heavy means high viscosity. Excessive friction may result from an oil of either high or low viscosity. Too high a viscosity will give a good oil film yet the friction in itself will be excessive. If the viscosity is too low the film may be broken.

Filter all lubricating oils before you use them and use just as thin an oil as you can, yet have a perfect film and you have practically solved your lubrication problem, as well as gone a long ways towards eliminating carbon deposits.

Iowa Sand and Gravel Producer Makes Improvements

THE Molo Sand and Gravel Co., Dubuque, Ia., has gone on a new sales basis with the completion of a summer building and repair program at its main plant, according to Bart Molo.

Heretofore sand and gravel has been sold through cubic yard measurement. Now all materials are being sold by weight, truck or carload. The company, to that end, has constructed a plant office at the yard equipped with a new 25-ton Howe scale.

The floating equipment repairs call for two of the six barge fleet to go on the ways during the 1931 fall season.

The Molo company handles river gravel and sand exclusively, now operating four company owned pits, and does channel dredging under grants by United States river engineers.

Business during the 1931 season was about half normal, according to Mr. Molo.

Seek Second Reduction in Gravel Tax Levy

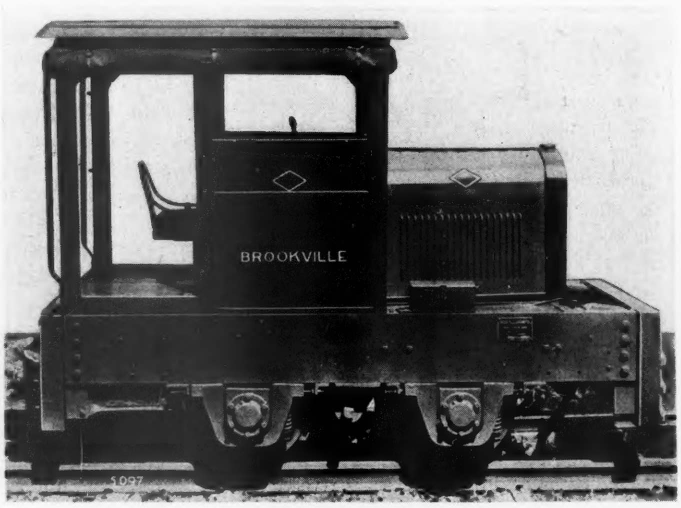
REDUCTION of the levy for gravel road expenditures in Decatur county, Indiana, from 35c., as asked for in the county budget, to 17c. was the outstanding feature of the session of the Decatur county board of commissioners. The rate last year was 25c. and an increase of 10c. had been recommended in the proposed budget. The net reduction of 8c. over last year is expected to be approved by the county council.—*Warsaw (Ind.) Times.*

New Machinery and Equipment

Gasoline-Powered Locomotive

A NEW LOCOMOTIVE is announced by the Brookville Locomotive Co., Brookville, Penn.

This locomotive is powered with a Ford model "AA" power plant. According to the manufacturer, features of construction of this locomotive are dual spring journal wheel suspension, steel tires, four speed reverse, providing four speeds in either direction up to 16 miles per hour, governor control, air cleaner for carburetor, Timken bearings at wheel journals and in the reverse gearing, three point link and pin coupler, self starter and new cab design.

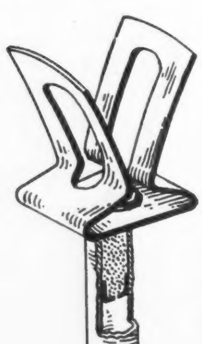


Four speeds, both forward and reverse

These models are made in 2, 2½, 3, 3½ and 4 tons weight for any gage of track.

Spring Connector for Cordeau

IN CONNECTING Cordeau for firing a number of shots, it has been necessary to split the end of the branch line for a distance of 6 or 8 in., and then to wind the two halves in opposite directions around the trunk line. To simplify this operation, E. I. du Pont de Nemours and Co., Wilmington, Del., has developed a Cordeau connector consisting of two parts: a clip made of spring steel and a special cap of copper which is partly filled with an explosive mixture similar to that in blasting caps. This mixture is held in place by an inner capsule having a small central aperture, as is shown in the illustration.



Handy when firing several shots

To use the device, the copper cap is dropped through the aperture in the clip and the freshly cut end of the branch Cordeau is inserted in the open end of the cap until it touches the inner capsule, being held in place by crimping. It is then a simple matter to complete the connection by springing the wings of the clip wide enough to admit the trunk line. The manufacturer states this makes a water proof connection that cannot be affected by snow or rain and at the same time requires only a fraction of the time used in the former method.

Truck Mixer Equipped with a Hoist

A HOIST for truck mixers, called the "Jackass" hoist, is announced by the Chain Belt Co., Milwaukee, Wis., for its line of "Rex" moto-mixers and moto-agitators.

This new hoist arrangement raises the discharge of the mixer 8 ft. from the ground to increase the spouting range. The hoist was developed with the cooperation of the Heil Co. of Milwaukee. It is a hydraulic hoist fitted to the rear end of the truck chassis and raises the discharge end of the mixer "just like a jackass raises his heels to kick." The Heil hoist used has been designed for this mixing unit. The lifting effort is exerted directly against the load to raise the drum the desired height.

Benefits that are gained with this hoist arrangement, the manufacturer states, are that sidewalks can be poured across parkways without wheeling; building foundations and walls can be chuted even when the truck cannot get within 10 to 20 ft. of the hole; and alleys and streets can be fanned their full width.

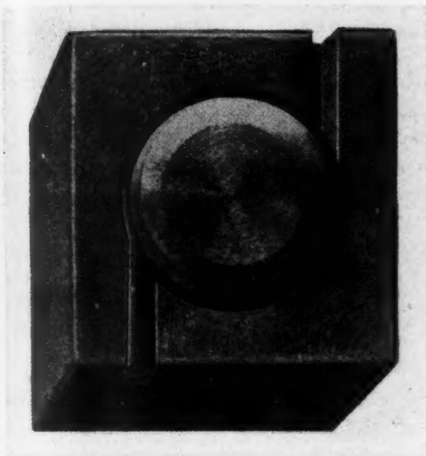
The hoist raises the drum high enough to discharge into a three-yard hopper, it is said. The flow of concrete can be regulated by the operator from a slow to a full discharge by a turn of a handwheel. Though the mixer is raised at a considerable angle, the drum empties itself cleanly and thoroughly, the manufacturer states.

Hoist extends discharge area of truck mixer

New Type Nut

A NEW TYPE OF NUT is now available in all types, the Safety Nut Corp., Philadelphia, Penn., announces. This nut is made with grooves so located that a pin nut key can be inserted in the groove and driven a full circumference of the bolt to which the nut has been applied, as shown in the accompanying illustration. According to the manufacturer, when this key has been inserted the nut will not loosen under the most intense vibration.

It is said the nut may be either loosened or tightened, with the key in place, by a wrench with normal pressure. Although only one key is needed to lock these nuts, several



Key is driven one circumference of bolt

entrances are provided in the event that the nut may come to rest in a place that might make entry of key difficult.

•

Centrifugal Pump

THE Worthington Pump and Machinery Corp., Harrison, N. J., recently announced a new pumping unit known as the Movable Type D centrifugal pump.

In this unit the pump is bolted to the motor frame and the impeller is mounted on the extended motor shaft. A ball-bearing Masterbilt motor is used.

The special features of the new unit are said to be: A shaft sleeve incorporated with the impeller to protect the shaft; a cadmium-plated steel locking device for fastening the impeller; a forged bronze packing gland; and a special arrangement of shaft water-throwers.

The unit is said to be applicable to all centrifugal pump uses.

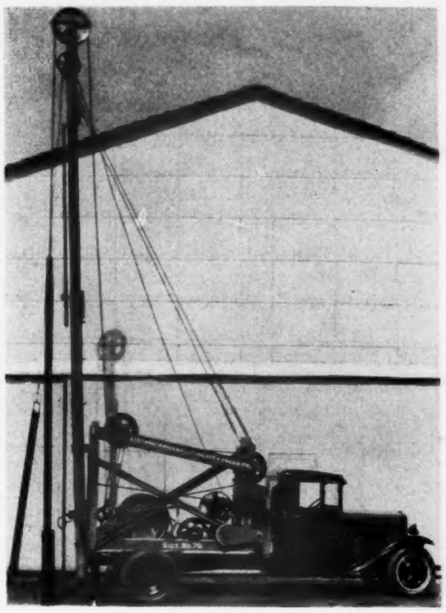
•

All Steel Well Drill for Light Truck Mounting

THE KEYSTONE No. 70 well drill is announced by the Keystone Driller Co., Beaver Falls, Penn. This drill has a 16-hp., 4-cylinder Waukesha engine, producing ample power and drives through two internal expanding clutches on a countershaft, to the rope drum and the drilling crank. Ball bearings are used on the drilling crank. All main shafts are 2⅞-in. in diam.

The Keystone No. 70 can be used with either manila cordage or wire drilling cable. With the former it is said to have a depth capacity of 300 ft., with wire line a depth capacity of 600 ft. It is also claimed to have a long, rapid stroke, 30 in. over the well and 60 blows per minute, and to handle 1400 lb. of drilling tools. This insures efficient operation with 3-in., 4-in., 6-in., 8-in. and 10-in. drill bits to ratable depths, the manufacturer states.

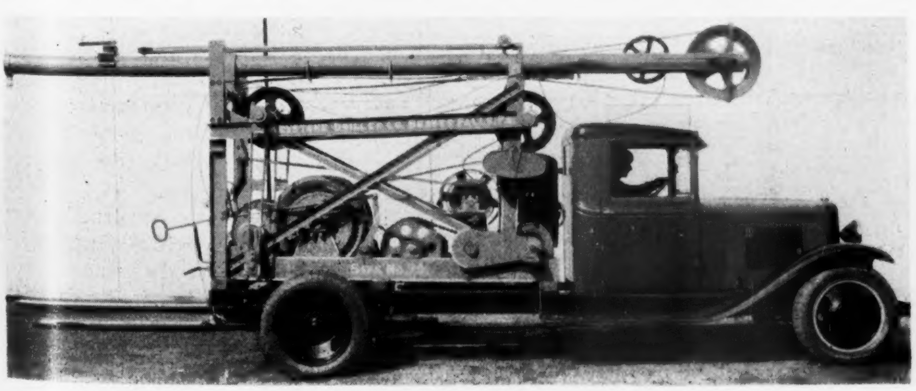
The most rapid and convenient form of mounting is said to be a 1½-ton truck. According to the manufacturer, a larger 3- or 5-ton truck can be used without disadvantage.



All ready to drill

For operation in country where roads are too rough for truck transportation, the machine is mounted on four iron wheels with wide tread, and supply tongue and doubletrees for hitching draught animals, or draw-bar for tractor.

The telescoping pipe derrick, which is 30 ft. high extended, a novel feature, is claimed to be of unusual strength and rigidity.



Dismantled and ready to move

Aluminum Alloy Shovels

THE WOOD SHOVEL and Tool Co., Piqua, Ohio, announces a new line of aluminum alloy shovels. These shovels weigh less than half as much as steel shovels, are tough, easy to keep clean, cannot rust and will not cause sparks, the manufacturer states.

Other advantages of these shovels, the manufacturer claims, are that workmen shovel faster, and with a minimum of effort and fatigue.

These shovels are made in a number of different styles, some of which are: general service scoops, concrete and ore scoops, and molders' scoops.

Concrete scoop

•

Worm Gear Reducers for Small Motor Drives

A SERIES OF THREE worm gear speed reducers for small electric motor drives—up to 7-hp. capacity—have been developed by the W. A. Jones Foundry and Machine Co., Chicago, Ill.

These small reducers are said to be almost identical with the heavy-duty Jones worm gear speed reducers except in size.

Similar to heavy-duty reducer

Stocks are kept in Chicago, Detroit, New York, Los Angeles and San Francisco. Authorized jobbers also carry stocks.

•

Crawler Mounted Crane

THE BUCYRUS-ERIE CO., South Milwaukee, Wis., has taken over the manufacture and sale of the "Loadmaster" revolving boom crane formerly sold by Frederic H. Poor, Inc., New York City.

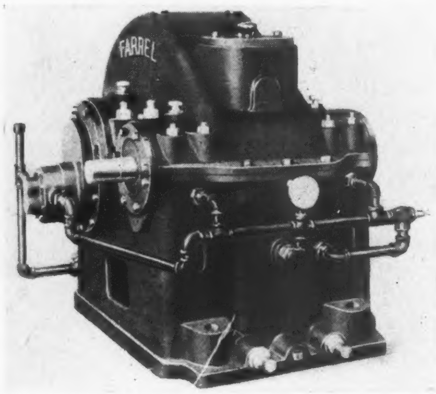
This crane, with a boom of 360 deg., has a rated capacity of 3500 lb. and a maximum working reach of 14-16 ft. It is said the machine may be mounted either on crawlers or on rubber-tired wheels.

High-Speed Gear Units

THE Farrel-Birmingham Co., Inc., Buffalo, N. Y., announces it has developed and standardized a series of gear units suitable for speeds up to 6000 r.p.m. and powers from 120 hp. to 2500 hp., with ratios up to 10 to 1 for either increasing or reducing speed.

This new series of gear units is said to be especially adapted for connecting diesel or gas engines to centrifugal pumps.

Features claimed for this series of high speed gear units are herringbone gears of high accuracy; gears designed for specific purpose for which they will be used; materials selected for hardness and toughness;

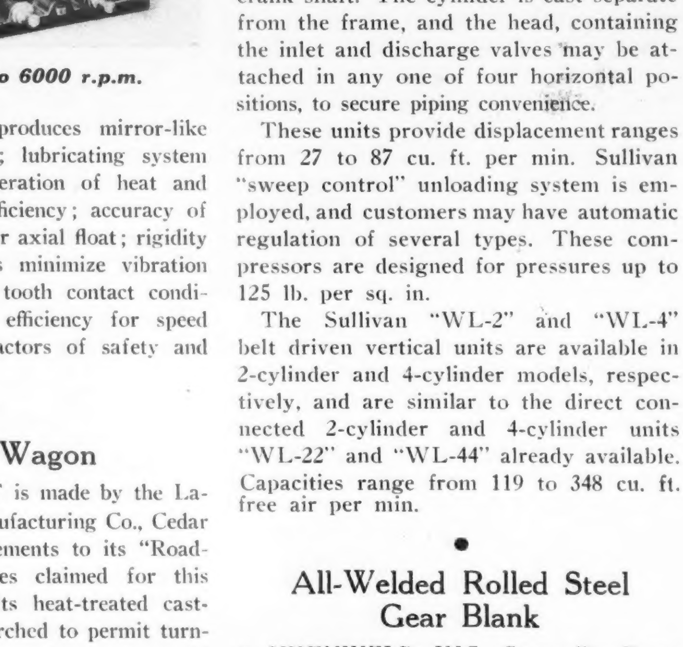


For speeds up to 6000 r.p.m.

new lapping process produces mirror-like tooth bearing surfaces; lubricating system prevents excessive generation of heat and increases mechanical efficiency; accuracy of gears eliminates need for axial float; rigidity and proper proportions minimize vibration and insure durability; tooth contact conditions give mechanical efficiency for speed reducing; and large factors of safety and correct proportions.

Crawler Wagon

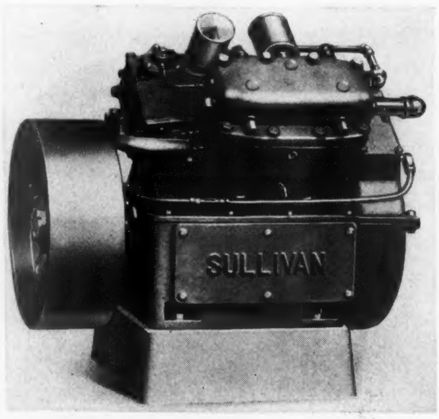
ANNOUNCEMENT is made by the La-Plant-Choate Manufacturing Co., Cedar Rapids, Ia., of improvements to its "Roadlayer" wagon. Features claimed for this improved wagon are its heat-treated cast-steel tongue which is arched to permit turning in a shorter radius, a box-type special cast-steel rear frame cross member and pull-bar casting permitting turning at 102 deg., simplified roller-bearing hand-winding mechanism, improved cable and sheave arrangement on the bottom of the doors, tracks of the wagon now follow in tracks of the tractor, and simplified and lighter hydraulic hoisting arrangement.



Arched tongue permits turning in short radius

Ball Bearing Compressors

THE SULLIVAN MACHINERY CO., Chicago, Ill., announces additions to its line of vertical single acting compressors, in new models, and new capacity ranges.



Balanced "V" type compressor

"WL-1" belt driven and "V" belt driven and "WL-11" direct motor driven compressors are single-cylinder, single-acting units, distinguished by the use of heavy duty ball bearings for mounting on the crank shaft. The cylinder is cast separate from the frame, and the head, containing the inlet and discharge valves may be attached in any one of four horizontal positions, to secure piping convenience.

These units provide displacement ranges from 27 to 87 cu. ft. per min. Sullivan "sweep control" unloading system is employed, and customers may have automatic regulation of several types. These compressors are designed for pressures up to 125 lb. per sq. in.

The Sullivan "WL-2" and "WL-4" belt driven vertical units are available in 2-cylinder and 4-cylinder models, respectively, and are similar to the direct connected 2-cylinder and 4-cylinder units "WL-22" and "WL-44" already available. Capacities range from 119 to 348 cu. ft. free air per min.

All-Welded Rolled Steel Gear Blank

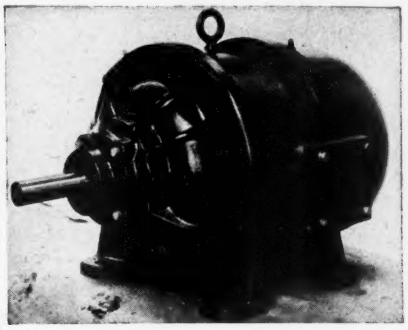
LUKENWELD, INC., Coatesville, Penn., (division of Lukens Steel Co.) has developed and is now manufacturing all-welded rolled steel gear blanks for use in the manufacture of gears.

The welded steel blank, which can be employed in the manufacture of spur, herringbone and helical gears, can be made any size from 24-in. outside diameter up.

All-welded gear blanks are ordinarily made entirely from S.A.E. 1020 carbon steel, but the manufacturer says rims can be furnished in steels of special analyses.

Totally Enclosed Fan-Cooled Motor

A NEW totally enclosed fan cooled squirrel cage motor for use in explosive atmospheres has been designed by the Westinghouse Electric and Manufacturing Co., East Pittsburgh, Penn., to meet the latest specifications of the National Board of Fire Underwriters for use in Class I, Group D, hazardous locations, the manufacturer states.



Fan blades on each end of rotor provide air circulation

Air inside the motor is kept in circulation by fan blades on each end of the rotor. The bearings are of cartridge type and are said to have low maintenance and long life due to their location on the outside of bearing bracket. The prewound primary core is interchangeable and renewable.

Control Benchboards

THE INCREASED APPLICATION of control benchboards in connection with conveyor systems and remotely controlled haulage or larry car systems is said to have led the General Electric Co. to introduce a design of benchboard construction which makes possible the use of standard controllers, push-buttons, indicating lamps, etc.

According to the manufacturer, the change in design allows the individual devices to be supported directly from the top of the board or frame.

All forms of this new construction are said to have removable backs, which facilitate assembly of the devices and provide ready access to the inside in case changes are necessary. If the benchboard is to be located with the back against the wall, it is provided with openings at both ends. The top can be either flat or sloped.

Cement Production in Canada, August, 1931

ELEVEN PLANTS produced portland cement in Canada during 1930. These plants, located in Quebec, Ontario, Manitoba, Alberta, and British Columbia, had a total daily capacity of 37,522 bbl. Production during the year amounted to 11,032,538 bbl. ranging from a minimum of 269,195 bbl. in January to a maximum of 1,504,508 bbl. in July, the Dominion Bureau of Statistics reports.

Contracts awarded for new construction in Canada declined 32% during the first six months of 1931. In contrast to this, the sales of cement during the half-year increased 3.97% over the corresponding period of last year. The continued falling-off in the volume of new construction work had its effect on cement sales, causing a decline in July of 27.6% and in August 24.3% below the totals for the corresponding months of 1930.

The August shipments were recorded at 1,109,977 bbl. as compared with 1,102,747 bbl. in July and 1,466,953 bbl. in August, 1930. Sales from Quebec plants during the month under review were higher than in July but a slight recession was shown in shipments from plants in the other provinces.

To Erect Phosphate Grinding Plant in California

THE Phosphate Fertilizer Co., Spokane, Wash., plans to install a mill for grinding 100 tons a day and later will erect a plant at Los Angeles for finer grinding, W. H. Honefenger, manager of the company, has said.

Oscar F. Nordquist, Wallace, Ida., has been appointed to manage mining operations of the company which are at Georgetown, Ida., the *Wallace* (Ida.) *Evening News* reports.

Will Direct Manufacturing

A. W. THOMPSON, who for the past five years has been Pacific Coast manager in charge of sales for Fairbanks, Morse and Co., Chicago, Ill., has been appointed vice-president in charge of manufacturing, according to an announcement made public by W. S. Hovey, president.

Mr. Thompson succeeds Mr. Heath, who resigned November 1.

That Mr. Thompson is well equalified for the position is evident from his past experience. He is an engineer by education, having graduated with an engineering degree from the Rennselaer Polytechnic Institute in 1907. Following this he had broad and varied experience in both engineering and sales work.

A. W. Thompson

In 1920 Mr. Thompson joined the Fairbanks-Morse organization as general manager of the Indianapolis plant and in 1926 he was transferred to San Francisco as Pacific Coast manager in charge of sales. In 1928 he was made a vice-president.

To Use Limestone in Production of Synthetic Rubber

DISCOVERY of a process to make synthetic rubber out of acetylene and salt and water was announced to the rubber division of the American Chemical society meeting at Akron, Ohio, November 2. Three chemists of the E. I. du Pont de Nemours and Co. explained the process in a scientific paper.

They stated that the synthetic material was not a substitute for natural rubber, but a supplement which might be employed in some of the thousands of uses. Also the artificial substance is expected to find uses in some lines where real rubber is not suitable.

For example, natural rubber is eaten by gasoline, but the paper stated that the new material was gasoline-resistant.

Acetylene, made from limestone and coal, is treated to obtain chloroprene, and that in turn is converted into a plastic mass by a chemical process called polymerization.

Certain important differences from natural rubber are claimed. One is more resistance to swelling action of gasoline, kerosene and other solvents. It is also more resistant to oxygen, ozone and some other chemical compounds which attack pure rubber.

It vulcanizes with application of heat alone, differing from rubber with which sulphur is used in addition to heat for vulcanization.

Certain of the commercial value of synthetic rubber, the du Pont de Nemours and Co. in Wilmington, Del., announced construction of a plant for manufacturing the new product was under way at Deepwater Point, N. J.—*Cleveland* (Ohio) *News*.

RETAIL MATERIAL PRICES, DELIVERED, OCTOBER 1, 1931 (COMPILED BY DEPARTMENT OF COMMERCE)

City	Portland cement, per bbl, exclu. of cont.	Gypsum wallboard, ⅜-in., per M	Hydrated lime, per ton	Building sand, per cu. yd.	Crushed stone, ¾-in., per ton	Gypsum plaster, neat, per ton
New Haven, Conn.	$2.70	......	$19.00	$1.25	$2.25	......
New London, Conn.	2.60	25.00	18.00	1.50	3.00	$18.00
Waterbury, Conn.	2.60	30.00	20.00	1.25	2.45	20.00
Haverhill, Mass.	2.32	25.00	18.50	......	......	18.50
New Bedford, Mass.	2.60	24.00	16.50	1.75	2.75	16.50
Albany, N. Y.	2.34	23.85	15.75	......	......	16.20
Buffalo, N. Y.	2.95	21.00	18.00	2.50	2.05	16.00
Poughkeepsie, N. Y.	1.95	......	......	......	2.00	......
Rochester, N. Y.	2.28	22.00	20.00	2.25	2.40	16.00
Syracuse, N. Y.	2.16	25.00	13.00	1.80	1.70	15.00
Paterson, N. J.	2.00	24.00	18.00	1.50	2.10	17.50
Philadelphia, Penn.	2.16	......	14.50	1.75	2.60	17.50
Scranton, Penn.	2.40	......	20.00	3.25	......	19.00
Baltimore, Md.	2.10	25.00	13.00	1.85	2.50	14.50
Washington, D. C.	1.78	25.00	12.00	......	......	16.00
Richmond, Va.	3.10	31.00	17.50	1.95	2.45	20.00
Fairmont, W. Va.	2.80	35.00	16.00	2.80	3.50	18.00
Columbia, S. C.	2.25	35.00	12.50	1.08	2.25	15.40
Atlanta, Ga.	2.00	......	12.50	2.81	2.50	15.00
Tampa, Fla.	2.60	......	24.00	2.00	4.00	......
Shreveport, La.	3.00	......	......	2.00	3.20	20.00
New Orleans, La.	2.20	......	13.00	2.00	......	18.00
Akron, Ohio.	1.74	......	12.00	1.50	2.50	14.00
Canton, Ohio	......	......	$16.00	$2.50	......	......
Cincinnati, Ohio	$1.94	$22.75	14.40	2.63	2.55	......
Cleveland, Ohio	1.68	......	10.00	1.69	2.15	$15.00
Columbus, Ohio	2.35	......	12.00	1.50	2.75	14.40
Toledo, Ohio	1.80	21.00	15.00	1.60	1.75	14.00
Lansing, Mich.	2.25	......	20.00	1.80	1.80	17.50
Saginaw, Mich.	1.76	24.00	16.00	2.25	......	17.00
Terre Haute, Ind.	2.25	28.00	18.00	1.25	3.00	18.00
Louisville, Ky.	1.86	......	15.50	2.00	2.15	17.00
Milwaukee, Wis.	1.75	22.00	14.00	1.35	1.35	15.20
Des Moines, Iowa	1.42	23.50	19.00	1.40	4.15	14.00
Kansas City, Mo.	1.80	25.00	......	1.70	1.88	15.00
St. Louis, Mo.	......	......	18.00	1.35	1.30	18.00
St. Paul, Minn.	2.15	21.00	19.00	1.25	1.75	17.00
Grand Forks, N. D.	2.60	......	......	2.60	......	19.00
Sioux Falls, S. D.	2.40	......	24.00	1.25	2.25	15.50
Tulsa, Okla.	1.90	22.50	22.00	.85	2.35	16.00
San Antonio, Tex.	2.43	42.00	20.00	2.25	2.35	17.00
Tucson, Ariz.	2.25	45.00	30.00	1.25	2.25	17.10
Los Angeles, Calif.	2.30	23.50	24.70	1.85	1.90	15.20
San Francisco, Calif.	......	45.00	22.50	1.40	1.60	16.90
Seattle, Wash.	2.40	35.00	22.00	1.40	1.90	18.00

Current Prices of Ready-Mix Concrete

AMARILLO, TEX.—Prices per cu. yd.*

Lime Mortar

Mix	
1-4	6.50
1-4½	6.25
1-5	6.00

Terrazzo

Mix	
1-3 -0	9.75
1-3½-0	9.25
1-4 -0	8.75
1-4½-0	8.50
1-5 -0	8.25

Topping

Mix	
1-1 -0	13.75
1-1½-0	12.75
1-2 -0	11.75
1-2½-0	11.25
1-3 -0	10.75
1-3½-0	10.25

Base—Strength

4000 lb. per sq. in.	9.75
3500 lb. per sq. in.	9.25
3000 lb. per sq. in.	9.00
2500 lb. per sq. in.	8.75
2000 lb. per sq. in.	8.50
1500 lb. per sq. in.	8.25

Base

Mix		Mix	
1-2 -3½	9.25	1-3 -5	8.00
1-2¼-4	9.00	1-4 -6	7.25
1-3½-4½	8.00		

*For orders of 50 cu. yd. or more, prices are 75c less per cu. yd. than quoted. Free delivery within city limits for 2 cu. yd. or more per load; $1.00 per load extra for less than 2 cu. yd. loads, except to finish a job. Additional charge of 10c per mile per cu. yd. for deliveries outside of city limits.

BELLINGHAM, WASH.—Prices per cu. yd.¶

Mix	Retail, f.o.b. bunkers	In carloads	Mix	Retail, f.o.b. bunkers	In carloads
1-3-4	6.85	6.10	1-2-3	7.85	6.91
1-3-5	6.51	5.75	1-2-4	7.27	6.50

¶Additional charges for delivery to various zones. First zone, added charge of 75c per cu. yd.; second zone, added charge of $1.05; third zone, added charge of $1.40; fourth zone, added charge of $1.75.

BOSTON AND CAMBRIDGE, MASS.—Base price per cu. yd.‡

Mix		Mix	
1-2- 4 (3 to 30 cu. yd.)	10.00	1-2- 3 (30 cu. yd. and over)	8.20
1-2 -4 (30 cu. yd. and over)	7.75	1-1½-3 (3 to 30 cu. yd.)	10.55
1-3 -6 (3 to 30 cu. yd.)	9.50	1-1½-3 (30 cu. yd. and over)	8.30
1-3 -6 (30 cu. yd. and over)	7.25	1-1-2 (3 to 30 cu. yd.)	11.30
1-2½-5 (3 to 30 cu. yd.)	9.75	1-1-2 (30 cu. yd. and over)	9.05
1-2½-5 (30 cu. yd. and over)	7.50	1-2 (3 to 30 cu. yd.)	13.00
1-2 -3 (3 to 30 cu. yd.)	10.45	1-2 (30 cu. yd. and over)	10.75

‡Discount of 50c per cu. yd. allowed on deliveries made between the 1st and 15th of the month if bill is paid on or before the 25th and on deliveries made between 15th and 30th if paid on or before the 10th of following month.

CHAMPAIGN, ILL.—Prices per ton (weight, 4000 lb. per cu. yd.)

Mix		Mix	
1-2-3	5.25	1-2-4	4.75
1-3-5	4.50		

† 5% trade discount to contractors. Prices to both contractor and consumer subject to cash discount of 5% for payment by 10th of month following del. For quick strength concrete, 1-2-3 mix, extra charge of $1.50 per ton; 1-2-4 mix, $1 per ton extra. Added charge of 25c per ton for the use of chloride, lime or Celite in any wet mix. For heating concrete, 12½c extra per ton. For topping, any mix, $1.35 for each sack of cement used.

COLUMBUS, OHIO—Delivered prices per cu. yd.

	Zones§									
Mix	1	2	3	4	5	6	7	8	9	10
1-1½-3	7.05	7.25	7.45	7.65	7.85	8.05	8.25	8.45	8.65	8.85
1-2 -3	6.85	7.05	7.25	7.45	7.65	7.85	8.05	8.25	8.45	8.65
1-2 -3½	6.65	6.85	7.05	7.25	7.45	7.65	7.85	8.05	8.25	8.45
1-2 -4	6.45	6.65	6.85	7.05	7.25	7.45	7.65	7.85	8.05	8.25
1-2½-4	6.35	6.55	6.75	6.95	7.15	7.35	7.55	7.75	7.95	8.15
1-3 -4	6.25	6.45	6.65	6.85	7.05	7.25	7.45	7.65	7.85	8.05
1-2½-5	6.15	6.35	6.55	6.75	6.95	7.15	7.35	7.55	7.75	7.95
1-3 -5	6.05	6.25	6.45	6.65	6.85	7.05	7.25	7.45	7.65	7.85
1-3 -6	5.95	6.15	6.35	6.55	6.75	6.95	7.15	7.35	7.55	7.75
1-4 -8	5.85	6.05	6.25	6.45	6.65	6.85	7.05	7.25	7.45	7.65
1-2	9.55	9.75	9.95	10.15	10.35	10.55	10.75	10.95	11.15	11.35
1-3	7.95	8.15	8.35	8.55	8.75	8.95	9.15	9.35	9.55	9.75

§All zones radiating from center of city. Zone 1 is one mile in radius, zone 2 is two miles in radius, zone 3 is three miles in radius, etc. Discount of 25c per cu. yd. allowed for payment 10th of month following delivery date. For orders over 50 cu. yd. a deduction of 25c per cu. yd. is allowed. Orders of less than 2 cu. yd. carry same haul charge as 2 cu. yd. load. Orders for 2 cu. yd. or over delivered in full loads at 2 yd. or more.

DALLAS, TEX.†

	Slump				Slump		
Strength	½ in. to 1 in.	3 in. to 4 in.	6 in. to 7 in.	Strength	½ in. to 1 in.	3 in. to 4 in.	6 in. to 7 in.
1500	5.50	5.70	6.10	2500	6.05	6.25	6.65
2000	5.80	6.20	6.30	3000	6.40	6.80	7.00

Fixed Mixes (any slump)

1-2½-5	6.70	1-2-4	7.00	1-1½-3	7.70

†Prices subject to 2% 15 days and are based on quantities of 50 to 999 cu. yd. and on delivery in 2½-cu. yd. loads within Zone 1, which extends about 1½ miles from either of two plants. Zone charges are approximately 10c per cu. yd. per mile beyond the Zone 1 limit. On quantities under 50 cu. yd. add 20c and on quantities over 1000 cu. yd. deduct 30c.

CLEVELAND, OHIO (a)—Prices per cu. yd. to contractors for orders of 2 cu. yd. or more.

Public Square basing point
Aggregate: Limestone

Mix	1st mile	2nd mile	3d mile (Maximum)
1-1 -2	7.50	7.75	8.00
1-2 -3	6.30	6.55	6.80
1-2 -4	6.00	6.25	6.50
1-2½-3½	6.00	6.25	6.50
1-2½-4	5.80	6.05	6.30
1-3 -4	5.70	5.95	6.20
1-2½-5	5.60	5.85	6.10
1-3 -5	5.50	5.75	6.00
1-3 -6	5.40	5.65	5.90
1-4 -8	5.25	5.50	5.75
1-2 Finish	7.50	7.75	8.00
1-2½ Finish	7.00	7.25	7.50
1-3 Finish	6.50	6.75	7.00

Basing point: Windfall Road and Broadway, Bedford, Ohio
Aggregate: Bedford gravel

	Miles						
Mix	1st	2nd	3rd	4th	5th	6th	7th*
1-1 -2	6.50	6.75	7.00	7.25	7.50	7.75	8.00
1-2 -3	5.30	5.55	5.80	6.05	6.30	6.55	6.80
1-2 -4	5.00	5.25	5.50	5.75	6.00	6.25	6.50
1-2½-3½	5.00	5.25	5.50	5.75	6.00	6.25	6.50
1-2½-4	4.80	5.05	5.30	5.55	5.80	6.05	6.30
1-3 -4	4.70	4.95	5.20	5.45	5.70	5.95	6.20
1-2½-5	4.60	4.85	5.10	5.35	5.60	5.85	6.10
1-3 -5	4.50	4.75	5.00	5.25	5.50	5.75	6.00
1-3 -6	4.40	4.65	4.90	5.15	5.40	5.65	5.90
1-4 -8	4.25	4.50	4.75	5.00	5.25	5.50	5.75
1-2 Finish	7.00	7.25	7.50	7.75	8.00*	......	......
1-2½ Finish	6.50	6.75	7.00	7.25	7.50*	......	......
1-3 Finish	6.00	6.25	6.50	6.75	7.00*	......	......

*Maximum.

(a) Industrials or consumers 50c more than contractors. Extra charge for concrete delivered nights, Sundays or holidays, $1.00 per cu. yd. over daytime schedule. For high-early-strength or waterproofing cements additional charge of $2.00 per cu. yd. For waterproof concrete using Anti-Hydro with manufacturer's guarantee, additional charge of $2.00 per cu. yd. For orders less than 2 cu. yd. add $1.00 per yd. to above prices. Prices quoted are based upon normal discharge of load within 20 minutes after arrival of truck. A demurrage charge of $1.00 for each 15 minutes thereafter.

DES MOINES, IOWA—Prices per cu. yd. (b)

(Made with ¾-in. gravel for structural work)

			Zone			
Mix	Slump	Plant price	A	B	C	D
1-2½-5	2-in.	6.00	6.50	6.75	7.00	7.25
1-2½-5	6 in.	6.25	6.75	7.00	7.25	7.50
1-2 -4	2 in.	6.50	7.00	7.25	7.50	7.75
1-2 -4	6 in.	6.75	7.25	7.50	7.75	8.00
1-2 -3½	2 in.	7.00	7.50	7.75	8.00	8.25
1-2 -3½	6 in.	7.25	7.75	8.00	8.25	8.50
1-2½-3	2 in.	7.50	8.00	8.25	8.50	8.75
1-2½-3	6 in.	7.75	8.25	8.50	8.75	9.00

(Made with pea gravel for cellar and sidewalks)

			Zone			
Mix	Slump	Plant price	A	B	C	D
1-2½-5	2 in.	5.75	6.25	6.50	6.75	7.00
1-2½-5	6 in.	6.00	6.50	6.75	7.00	7.25
1-2 -4	2 in.	6.25	6.75	7.00	7.25	7.50
1-2 -4	6 in.	6.50	7.00	7.25	7.50	7.75
1-2 -3½	2 in.	6.75	7.25	7.50	7.75	8.00
1-2 -3½	6 in.	7.00	7.50	7.75	8.00	8.25
1-2½-3	2 in.	7.25	7.75	8.00	8.25	8.50
1-2½-3	6 in.	7.50	8.00	8.25	8.50	8.75

(b) Discount of 50c per cu. yd. allowed on deliveries made between the 1st and 15th of the month if bill is paid before the 25th and on deliveries made between 16th and 30th if paid before the 10th of following month. Quick setting $2.00 per cu. yd. extra; waterproofing, $2.00 per cu. yd. extra. Each zone approximately one mile.

FAIRMONT, W. VA.—Prices per cu. yd. (c)

Mix	Quantity	Delivered	Called for
1-2-4	Less than 1 cu. yd.	11.00	10.00
1-2-4	From 1 to 4 cu. yd.	10.00	9.00
1-2-4	From 5 to 10 cu. yd.	9.50	8.50
1-2-4	From 11 to 49 cu. yd.	9.00	8.00
1-2-4	From 50 cu. yd. and up	8.50	7.50

(c) For 1-2-3 mix add 50c per cu. yd. to prices quoted; for 1-3-5 mix deduct 50c per cu. yd. from prices quoted.

HARTFORD, CONN.—Prices per cu. yd. delivered.

Mix		Mix	
1-2-4	(d) 6.25	1-2-0 finish	12.00
1-3-5	(d) 5.90		

(d) Placing, $1.00 per cu. yd. extra.

INDIANAPOLIS, IND.—Prices per cu. yd. in small quantities, for delivery within 3-mile haul.

Mix	
1 bbl. cement/cu. yd. concrete	5.50
1¼ bbl. cement/cu. yd. concrete	6.00
1½ bbl. cement/cu. yd. concrete	6.50

LOS ANGELES, CALIF.¶—Prices per cu. yd.

Mix	1–5 yd.	5–25 yd.	25 or more	Mix	1–5 yd.	5–25 yd.	25 or more
3-50-50	8.25	7.25	6.25	1-2¾-3½	10.00	9.00	8.00
4-50-50	8.85	7.85	6.85	1-2 -4	9.85	8.85	7.85
1-3 -6	8.95	7.95	6.95	1-2½-3½	10.10	9.10	8.10
1-3 -5	8.95	7.95	6.95	1-2½-3¼	10.05	9.05	8.05
1-2½-5	9.50	8.50	7.50	1-2 -3	10.60	9.60	8.60
1-3 -4	9.75	8.75	7.75	1-2 -3½	10.20	9.20	8.20

¶Above prices for deliveries in Zone 1 (1-5 miles). Added charge of 75c per cu. yd. for deliveries in Zone 2 (5 to 10 miles). Added charge of $1.50 for Zone 3 (10 to 15 miles). Discount of 50c per cu. yd. if payment is made within 10 days from delivery.

MEMPHIS, TENN.—Prices per cu. yd. delivered in city.†

Strength	Portland	"Incor"	Strength	Portland	"Incor"
1800 lb.	6.50	7.30	3000 lb.	8.00	9.25
2000 lb.	7.00	8.00	3500 lb.	8.60	10.00
2500 lb.	7.50	8.50	4000 lb.	9.80	11.75

†Above prices based on gravel for aggregate. If stone is wanted for aggregate, additional charge of $1.00 per cu. yd. is made to above prices. 5% cash discount for payment 10th of month following date of invoice.

MILWAUKEE, WIS.—Prices per cu. yd. (e)

28-day breaking strength:	Per sq. in.	Slump: 2 to 4 in.	4 to 6 in.	6 to 8 in.
Garage footings and walls	2000 lb.	4.50	4.75	5.00
Footings, floors, walls	3000 lb.	5.50	5.75	6.00
City paving	3300 lb.	4.75	......	......
Sidewalks, curbs	4000 lb.	5.75	6.00	6.25
24-hour high early strength	5000 lb.	7.00	7.50	8.00

Sold on old mixture method, 2- to 4-in. slump; 4- to 6-in. slump; 6- to 8-in. slump.

	Mix	
Walls—Garage footing	1-3-5	4.50
City paving	1-2-4	4.75
Garage floors, walls	1-3-3	5.50
Sidewalk	1-2-3	5.75
Special strength (machine bases)	1-1½-2½	7.00
Facing	1-3	8.00
Facing	1-2	10.00

(e) Discount of 25c per cu. yd. if paid by 10th of following month.

MONTGOMERY, ALA.—Prices per cu. yd. delivered in city limits. (g)

Mix		Mix	
1-2 -4	6.25	1-3-6	5.60
1-2½-5	5.85	1-2 mortar topping	11.00

(g) Discount of 25c per cu. yd. for payment in 30 days. Special quotations for quantity orders.

MORGANTOWN, W. VA.—Prices for jobs of 1 to 10 cu. yd., delivered (f)

Mix		Mix	
1-2-3	9.50	1-2½-4	8.90
1-2-4	9.00	1-2½-5	8.50

(f) Prices subject to cash discount of 25c per cu. yd. for payment 15 days from date of invoice.

NEW ORLEANS, LA. (h)—Plant prices per cu. yd. for 30 yd. or less.

Mix	Cement: Portland	"Incor"	Mix	Cement: Portland	"Incor"
1-4 -8	5.15	6.10	1-2-2	7.70	10.25
1-3 -6	5.75	7.00	2-3-6	8.05	10.55
1-3 -5	5.95	7.35	2-3-3	8.85	12.00
1-2½-5	6.25	7.80	1-1½ topping	10.95	15.80
1-2½-4	6.40	8.15	1-2 topping	9.30	13.25
1-2 -4	6.75	8.60	1-3 topping	7.85	10.85
1-2 -3	7.20	9.40			

Plant prices per cu. yd., 30 cu. yd. or over:

Mix	Cement: Portland	"Incor"	Mix	Cement: Portland	"Incor"
1-4 -8	4.65	5.45	1-2-2	6.95	9.15
1-3 -6	5.15	6.25	2-3-6	7.25	9.45
1-3 -5	5.35	6.55	2-3-3	8.00	10.70
1-2½-5	5.65	7.00	1-½ topping	9.85	14.10
1-2½-4	5.80	7.25	1-2 topping	8.40	11.80
1-2 -4	6.05	7.70	1-3 topping	7.05	9.60
1-2 -3	6.50	8.40			

(h) All prices subject to 5% 15 days, 30 days net. Haulage based on various zones.

NEWARK AND HARRISON, N. J.§

1-2 -4	7.50	1-3 -6	6.75
1-3 -5	7.00	1-2½-5	6.85

§Discount of 2% if paid by 10th of month following delivery.

NEW YORK CITY, N. Y.‡—Prices per cu. yd.

Manhattan and Bronx Mix		Queens Mix	
1-1½-3	10.00	1-1½-3	8.75
1-2 -4	9.25	1-2 -4	8.25
1-2½-5	8.75	1-2½-5	8.00
1-3 -6	8.25	1-3 -6	7.75

Westchester County (within radius of 7 miles)

1-1½-3	9.25	1-2½-5	8.00
1-2 -4	8.50	1-3 -6	7.50

Brooklyn

Mix	Under 50 cu. yd.	Over 50 cu. yd.	Mix	Under 50 cu. yd.	Over 50 cu. yd.
1-1½-3	9.75	8.75	1-2½-5	9.25	8.00
1-2 -4	9.50	8.25	1-3 -6	9.00	7.75

‡Special designed mixes on the strength basis priced according to the strength desired. Average price for 2000-lb. concrete in the Borough of Manhattan, $9.00 per cu. yd.

OMAHA, NEB.*—Prices per cu. yd. for quantities from 1 to 300 yd., delivered anywhere within the city.

	28-day strength			28-day strength	
No. 1.	3500 lb. sq. in.	7.35	No. 3.	2500 lb. sq. in.	6.95
No. 2.	3000 lb. sq. in.	7.15	No. 4.	2000 lb. sq. in.	6.75

Transit-Mix Concrete

	28-day strength			28-day strength	
No. 1.	3600 lb. sq. in.	7.50	No. 3.	2600 lb. sq. in.	7.10
No. 2.	3100 lb. sq. in.	7.30	No. 4.	2100 lb. sq. in.	6.90

*Sand-gravel mix used as aggregate. No. 1, 6 sacks cement per cu. yd. concrete; No. 2, 5½ sacks cement; No. 3, 5 sacks cement; No. 4, 4½ sacks cement. For high-early-strength concrete using "Quikard" or other supercement. add $2.50 per cu. yd.

PITTSBURGH, PENN.—Range of prices, according to zone, for ready-mixed concrete. Prices per cu. yd. delivered, up to 50 cu. yd. (j)

Mix	Strength		Mix	Strength	
1-1½-2½	4000 lb.	8.10	1-2½-4½	2500 lb.+	7.25
1-2 -3	3500 lb.+	7.75	1-2½-5	2500 lb.	7.10
Class A	3500 lb.	7.60	1-3 -5	2000 lb.	7.00
1-2½-3½	3000 lb.+	7.50	1-3 -6	1500 lb.	6.90
1-2 -4 Class B	3000 lb.	7.40			

Prices per cu. yd. delivered, over 50 cu. yd. (j)

Mix	Strength		Mix	Strength	
1-1½-2½	4000 lb.	7.10	1-2½-4½	2500 lb.+	6.25
1-2 -3	3500 lb.+	6.75	1-2½-5	2500 lb.	6.10
Class A	3500 lb.	6.60	1-3 -5	2000 lb.	6.00
1-2½-3½	3000 lb.+	6.50	1-3 -6	1500 lb.	5.90
1-2 -4 Class B	3000 lb.	6.40			

(j) Class A concrete is a special concrete prepared for the city of Pittsburgh. Plus indicates the strength shown is the minimum strength. Dealer's commission of 50c per cu. yd. allowed in all zones with exception of Yellow Zone. No commission allowed over 200 cu. yd. Prices subject to cash discount of 25c per cu. yd. for payment 15 days from date of invoice.

PUEBLO, COLO.—Prices per cu. yd.‖

Strength	Zone 1	Zone 2	Zone 3	Strength	Zone 1	Zone 2	Zone 3
3000 lb.	8.00	8.40	8.80	2100 lb.	7.10	7.50	7.90
2700 lb.	7.75	8.15	8.55	1500 lb.	6.50	6.90	7.30
2400 lb.	7.50	7.90	8.30	1200 lb.	6.50	6.90	7.30

‖On larger quantities to contractors, deduct 50c per cu. yd.

ROCHESTER, N. Y.—Prices per cu. yd.

Mix	Plant price	Prices for delivery to various zones: Zone 1	2	3	4	5	6	7
1-2 -3	7.00	7.75	7.90	8.05	8.20	8.35	8.50	8.65
1-2½-3½	6.55	7.30	7.45	7.60	7.75	7.90	8.05	8.20
1-3 -4½	6.20	6.95	7.10	7.25	7.40	7.55	7.70	7.85
1-4 -5	6.00	6.75	6.90	7.05	7.20	7.35	7.50	7.65
1-5 -6	5.65	6.40	6.55	6.70	6.85	7.00	7.15	7.30

ST. PAUL, MINN.—Prices per cu. yd. delivered within three miles of plant. (m)

1-2-4 mix.......... 6.75   1-3-5 mix.......... 6.30

(m) For greater distances of haul, increase of 10c per cu. yd. per mile.

SAN ANTONIO, TEX.—Prices per cu. yd. on city deliveries.‡

Mix		Mix	
1-3-5	6.50	1-2-4	7.00

‡Deduction of 50c per cu. yd. on large orders for delivery one mile of plant.

SAN JOSE, CALIF.—Prices per cu. yd. delivered within one mile of plant. (k)

Mix	Up to 5 cu.yd.	Over 5 cu.yd.	Mix	Up to 5 cu.yd.	Over 5 cu.yd.
1-6	9.00	8.50	1- 9	8.00	7.50
1-7	8.50	8.00	1-12	7.00	6.50

(k) For deliveries outside of this area add 30c per cu. yd. per mile. Cash discount of 50c per cu. yd. if paid in full by 10th day of following month.

SANTA CRUZ, CALIF.—Price per cu. yd. delivered within two-mile radius of plant. (l)

Mix	Over 5 cu.yd.	Less than 5 cu.yd.	Mix	Over 5 cu.yd.	Less than 5 cu.yd.
1-6	9.00	9.50	1-8	8.10	8.60
1-7	8.50	9.00	1-9	7.90	8.40

(l) For deliveries outside of this area add 30c per cu. yd. per mile. Cash discount of 50c per cu. yd. if paid in full by 10th day of following month.

SPRINGFIELD, ILL.—Prices per cu. yd.

Mix		Mix	
1-3 -6	9.00	1-2 -3½	10.00
1-3 -5	9.20	1-2 -3	10.20
1-2½-4	9.45	1-1½-3	10.55
1-2 -4	9.75	1-1 -2	11.25

WATSONVILLE, CALIF.—Prices per cu. yd.‖

Mix		Mix	
1-6	9.90	1- 9	8.50
1-7	9.30	1-12	7.75
1-8	9.00		

‖Prices are for delivery anywhere within city limits, and are subject to cash disc. of 50c cu. yd. for payment on or before 10th day of following month.

WILKES-BARRE, PENN.—Prices per cu. yd. delivered within one mile of plant, subject to discount of 25c per cu. yd. for payment within 10 days from date of delivery. Extra charge of 15c per cu. yd. for each additional mile.

Mix	Gravel	Stone	Mix	Gravel	Stone
1-2 -3	7.60	7.90	1-3-5	6.75	7.05
1-2 -4	7.30	7.60	1-3-6	6.75	7.05
1-2½-5	7.00	7.30			

News of All the Industry

Incorporations

Arizona Gypsum Plaster Co., Douglas, Ariz., $100,000. Caroline M. Adamson, S. G. Dowell and H. W. Williams, all of Douglas.

Wadley Asbestos Co., Inc., Dallas, Tex., $25,-000. B. M. Wadley, S. Y. Guthrie and W. G. Buster.

Absecon Sand Co., Atlantic City, N. J., $125,-000. Morris Bloom, Atlantic City. To produce sand, bricks, etc.

Binghamton Crushed Stone and Gravel Corp., Binghamton, N. Y. (succeeding Frank J. Boland. Inc.).

Edison Fuel and Material Co., 6615 Avondale Ave., Chicago, Ill., 1000 shares of no par value. Albert R. Hook, Marie H. Hook and Marie J. Hook. To deal in fuel, sand, wood, gravel, etc.

Wm. J. Breen Gravel Co., Grand Rapids, Mich., $150,000. Wm. J. Breen of Grand Rapids, Wm. H. Allswede of Hersey, Mich., and George A. Clerum of Evart, Mich.

Rhodes-Shea, Inc., Leominster, Mass., 1000 shares of no par stock. Samuel M. Salny, Phillip Salny and Ruth Williams, all of Fitchburg, Mass. To operate quarries.

Quarries

Berea, Ohio, quarries suspended work in October. It is reported the winter stripping will be limited, if any is done.

Mastin Simpson, Kansas City, Mo., is reported to have leased a tract near Leslie, Ark., on which to operate a marble quarry.

American Black Granite Co., Mellen, Wis., recently received instructions in first aid. This instruction was given in the safety car of the United States Bureau of Mines.

Lancaster, Ky. A state rock crusher being operated by F. N. Davenport is reported to be producing crushed stone at a cost of less than 60c. per ton.

France Stone Co. has closed its crushing plant at Waterville, Ohio, for the winter, but loading and stripping will be continued for some time, it is reported.

Columbia Marble Co., Knoxville, Tenn., has announced plans for a $125,000 plant to be located in the town of Marble, N. C. Construction will start at once.

Mann Co., Inc., Norristown, Penn., recently received publicity in the local paper describing its product and uses. Stripping is offered for the cost of hauling.

Texas Quarries, Inc., Austin, Tex., plans expansion of business activities to include the quarrying and marketing of Llano county granite, C. N. Avery, company official, has announced.

Delaware, Ia. A crusher was ordered for use on the Robert Sheldon farm following discovery of a quantity of limerock on the farm testing 99 to 100%.

Glenwood Springs, Colo. The quarry near here has been closed and probably will not be open until sugar companies are again in need of limestone.

Charlotte Marble and Granite Co., Charlotte, N. C., recently took a party of salesmen and officials on an inspection trip of its quarries at Rion, S. C. Much enthusiasm was created as a result of this trip.

Harold Smith, an employe of the Armbrust stone quarry near Washington Court House, Ohio, narrowly escaped death when his right arm was caught in the conveyor at the crusher. He was severely injured.

Chattanooga, Tenn. The city, through Commissioner Zach Taylor, has purchased the quarry and properties formerly owned by J. D. Allen, for $3500. The quarry is estimated to contain 120,000 cu. yd. of stone. The stone is to be used on street work.

Durham, N. C. The rock quarry near the convict camp which has been operated by the state since the county roads and road equipment passed into the hands of the state highway commission is now in a dismantled state and will not be repaired for the present.

Taylor Stone Co. has started production at its new plant at Ada, Ohio. The plant has a capacity of 250 tons of crushed stone per day. It is expected that two 8-hour shifts will be maintained for some time. E. C. Taylor is president and manager of the company and Walter Anspach is manager of production.

Atlas Rock Co., Oakdale, Calif., has arranged working schedules to insure continuous work at the plant instead of intermittent shutdowns. Employes have been put on a monthly salary basis instead of hourly, and it is reported operations of the plant are insured for the next six months. A salesman with headquarters at Oakdale is to be added at once. A. K. Humphreys of Alameda has succeeded H. G. McMillan as manager of operations.

Sand and Gravel

Greenville Sand and Gravel Co., Greenville, Miss., will resume operations soon.

Elam Sand Co., Brighton, N. Y., has filed notice of dissolution.

Hamilton, Ohio. Herbert Schatzel, 20, was buried beneath a slide of gravel while working with his brother George in a pit here. He died before being rescued.

Crystal Springs Sand and Gravel Co., Crystal Springs, Miss., is considering installation of additional equipment, including pumping machinery, conveying equipment, pipe lines, etc.

Marshalltown, Ia. No sealed or oral bids were made for the proposed $2500 in bonds offered by the city to cover the cost of graveling certain streets. The issue probably will be advertised again.

Johnson Sand and Gravel Co., North Hollywood, Calif., has been granted a permit to renew operations at its plant, 10417 Remsen St. The plant has been idle for some time but is expected to renew operations soon.

C. R. Jones and **W. G. Walker**, who operate a sand pit near Lumber City, Ga., recently were given publicity in the *McRae* (Ga.) *Enterprise*. The story described the extent of operations and the amount of equipment required to produce a high quality product.

Santa Paula Rock and Sand Co., Fillmore, Calif., entertained a group of city officials and local contractors upon the completion of its new plant recently. After a visit of the plant a barbecue was enjoyed. A. C. Vela and Ramon Prieto head the organization.

S & L Gravel Co., Marion, Ind., has brought suit against Luther Speidel, county auditor, seeking to force payment of four claims allowed by the county for gravel for which the auditor refused to issue warrants. The auditor maintains the money was not appropriated for the gravel at the time it was purchased.

Georgia Sand and Gravel Co., Thomson, Ga., had its operations described in a news story in the *Thomson Progress* recently. Credit was given the competent manager for progress which the company has made. It is reported its new plant now nearing completion will have a capacity of 1000 tons a day.

Nugent Sand Co., Louisville, Ky., has filed suit against the Stoll Oil Refining Co. for damages and asks an injunction to prevent flow of oil, gas and other substances into the Ohio river. The petition alleges oil and gas accumulated in front of the river property of the Nugent company and that it became ignited and damaged barges of the firm.

Mississippi Clay Co., Charleston, Miss., is cooperating with the Independence Co. of Memphis, Tenn., in the development of clay and gravel deposits near Charleston, Miss. After a recent inspection of the deposits Percy Parker, an official of the Independence company, said: "I believe these deposits will bring untold wealth to this section and I intend to bend every effort in the realization of this project."

Cement

Riverside Cement Co., Riverside, Calif., resumed operations at its plant October 1.

Universal-Atlas Cement Co. stopped production operations at its Ilasco plant November 1. Shipments will be made from stock, it is announced.

Lehigh Portland Cement Co. is said to plan to reopen its Mitchell, Ind., plant early in November, following a temporary shutdown October 15.

Oregon-Portland Cement Co., Portland, Ore., recently entertained a group of Baker, Ore., business men at its Lime plant. J. M. McClenahen, superintendent, showed the party through the plant.

Marquette Cement Manufacturing Co., Chicago, Ill., is reported to have closed barge transportation from its La Salle plant for this year. The barges will operate for some time between the Cape Girardeau plant and its Memphis terminal.

Kosmos Portland Cement Co., Kosmosdale, Ky., featured the Superior Ready Mixed Concrete Co., Cincinnati, Ohio, and its work in connection with the new Cincinnati Terminal in the November issue of *Kosmos Cement News*.

Newaygo Portland Cement Co., Newaygo, Mich., will make necessary repairs during the winter and resume operations in the spring, J. B. John, president of the Medusa Portland Cement Co. has announced. Shipments will be continued throughout the winter.

Pittsburgh, Penn. A picture was recently printed in the *Pittsburgh* (Penn.) *Press* entitled "When Edison Was in the Cement Business." It showed Thomas A. Edison and Edw. A. Darling seated in a buggy en route to Edison's cement plant at Stewartsville, N. J., at about the time the plant was built.

Cement Products

Nepco Cement Block Co., Yonkers, N. Y., recently suffered a loss estimated at $3000 in one of its buildings. The fire started in the boiler room and spread to other parts of the building.

Gay Ornamental Concrete Works, Savannah, Ga., has opened a plant in Waycross, Ga. It will manufacture ornaments for lawns and cemeteries at this plant, H. A. Gay has announced. This company also operates a plant at Savannah.

Groman Bros., Tiffin, Ohio, recently displayed their products, concrete blocks and tile, in the local chamber of commerce window as part of the program of the chamber of commerce to develop local industries.

Shelton Concrete Products Co., Shelton, Wash., has started manufacture of a large order for concrete culvert pipe to be used on the new Olympic highway work near Shelton, Robert Stoy, local plant manager has announced.

Everett Concrete Products at Everett, Wash., recently obtained a publicity story in the local newspaper based on the fire resistance of concrete masonry as demonstrated in tests at the Portland Cement Association in Chicago.

Maloney Paving Co., Washington, D. C., was recently given an interesting publicity story on its rapid development in the ready mixed concrete business. The news story appeared in the October 17 issue of the *Washington Times* and briefly described the benefits of ready mixed concrete.

Lime

Eugene, Ore. If laboratory and field tests are favorable and if enough interest is shown by farmers in this vicinity the Quick Silver Syndicate will install machinery and necessary equipment to prepare and distribute agricultural lime in commercial quantities next spring.

J. J. Keegan and **C. E. Van Orman** were recently in Entiat, Wash., receiving subscriptions for stock in the Superior Lime and Mining Co., a $300,000 corporation to develop and market the lime deposits of Entiat Valley. About $14,000 was said to be required before construction of the plant will start.

Miscellaneous Rock Products

U. S. Asbestos Corp. plans construction of an asbestos mill at Napa, Calif., to cost $20,000.

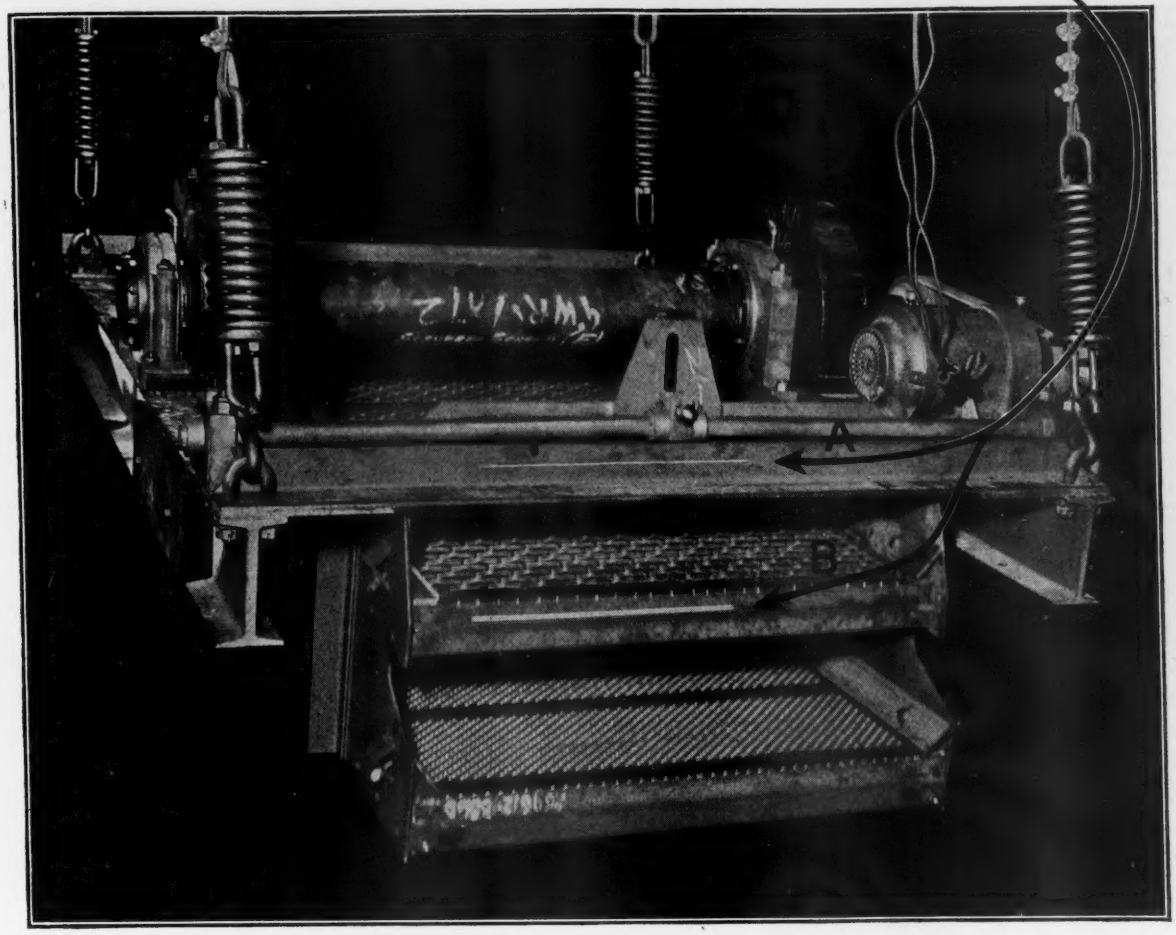
Dunnellon Phosphate Co., Hernando, Fla., is reported to be building new structures and installing new equipment.

Central Asbestos Corp., Wabash, Ind., is reported as planning to move its operations to Johnstown, Penn.

U. S. Potash Co. is said to be planning construction of a 2000-ton refinery to be located near Carlsbad, N. M.

Maltby Magnesite Mines plant, near Livermore, Calif., destroyed by fire recently, will be rebuilt soon. More than $50,000 worth of buildings and equipment were destroyed.

See these lines



This is an unretouched photograph of a screen operating at full speed on test rack

... they are both the same width. The line "A" in the cross frame shows minimum vibration on support frame.

- The line "B" shows effective vibration on screen body and screen cloth.
- The spring and cable suspension as designed and adopted by Allis-Chalmers removes all vibration from building.
- We will be glad to send a copy of Bulletin 1470-C describing these screens or to assist in solving your screen problems.

ALLIS-CHALMERS

Allis-Chalmers Manufacturing Company, Milwaukee

Dixie Asbestos Co., Birmingham, Ala., distributors for Keasbey and Mattison products, has had Georgia and Florida added to its territory for the building material line.

Texas Gulf Sulphur Co., New York, N. Y., is reported to have acquired sulphur rights from Gulf Production Co. of Pittsburgh in Jefferson county, Texas.

Anaconda Copper Mining Co. has announced that it is resuming normal operations in the phosphate division of its properties, located at Conda, Idaho.

Philadelphia Quartz Co., Philadelphia, Penn., described the chemical properties and functions of silicate of soda for use in soap in a recent issue of its publication, *Silicate P's and Q's*.

Annandale Graphite Corp., Annandale, N. J., is carrying out expansion and improvements at mines preparatory to resumption of operations at plant and will install new equipment. Harold D. Tonkins is general manager.

American Cyanamid Co., New York, N. Y., has renewed an option on 2100 acres near Kingsport, Tenn., where limestone deposits have been located, and contemplates erection of electrochemical works to cost over $10,000,000.

Jacksonville, Fla. The *Times-Union* of Jacksonville, Fla., recently discussed the extent of the limerock industry in Florida in an article and told of the increasing market for this production. It said thousands of tons have been shipped from the Florida plants for use by the Georgia Highway Department.

Personals

Hubert B. Clark has been made superintendent of the Georgia Stone and Cement Co. at Portland, Ga.

Ralph Leavenworth has been appointed advertising manager of the Westinghouse Electric and Manufacturing Co. He will have charge of all advertising and publicity matters of the company. The business career of Mr. Leavenworth prior to his association with the Westinghouse Electric and Manufacturing Co. has been one of which sales and advertising administrative work have been closely paralleled. He will have his office in the East Pittsburgh headquarters of the company.

R. Leavenworth

B. F. Morris, general manager of the Pioneer Sand and Gravel Co., Seattle, Wash., has been elected vice-president of the Building Material Dealers' Association.

W. K. Hunter, engineer of the Williams Lime Co., recently spoke to the Technical Club of Knoxville, Tenn., on the uses of lime. He also described the methods of manufacture.

Harry S. Sleicher, formerly vice-president of the North American Refractories Co., is now associated with the General Refractories Co. in a sales capacity with headquarters in its New York office.

Fred V. Kimball, plant inspector for the Gifford-Hill and Co., Inc., Dallas, Tex., was painfully injured and his car demolished when he was hit by another car recently. Mr. Kimball suffered two broken ribs and other injuries.

Obituaries

Frank Weiser, an employe of the Dixon plant of the Medusa Portland Cement Co., died on September 25.

Eliza Yates, for more than ten years the general foreman of the California Portland Cement Co., in Colton, Calif., died October 8 at a hospital in Glendale.

Philip A. Koehring, president of the National Equipment Co., Milwaukee, Wis., was found dead in his car October 31 near Mauston, Wis. The cause of death has not been determined.

John Jones, negro, 87, died October 15 at his home in Indianapolis. Starting with a nondescript horse and a rattletrap wagon, Mr. Jones built up a business by dealing in sand and gravel and at the time of his death was president of the John Jones Gravel Co.

Will S. Knight, who at one time operated the Knight Gravel Co., was killed instantly in an automobile accident near Memphis, Tenn., recently. His gravel pit operations were at Brunswick and at Camden, Tenn. These were discontinued in 1924 when he was elected sheriff of the county in which he resided.

Manufacturers

Polysius Corp., Bethlehem, Penn., announces the appointment of H. Joseph Hoffman as secretary and treasurer of the company.

Westinghouse Electric and Manufacturing Co., East Pittsburgh, Penn., announces the election of W. L. Mellon as a member of the executive committee to succeed the late Harrison Nesbit.

Shunk Manufacturing Co., Bucyrus, Ohio, has taken over the manufacture and sale of the Meyer Auto Snow Plow, which was formerly manufactured by the Empire Plow Co., Cleveland, Ohio.

Grindle Fuel Equipment Co., Harvey, Ill., announces the appointment of C. F. Herington as sales engineer. Mr. Herington has had 28 years experience in engineering work and for the past 15 years has been engaged in selling pulverized coal plants.

Young Radiator Co., Racine, Wis., reports much increased activity during the past three months. It is reported that much of this activity is from a new line of car heaters, convectors and cabinet and wall radiation and a new design of heater.

Foote Bros. Gear and Machine Co., Chicago, Ill., announces, through its president, J. F. Griswold, that the proposed merger of that company and the Dodge Manufacturing Co. has been abandoned. It is understood that each company will carry on its business as in the past under its own separate corporate name and identity.

Dardelet Threadlock Corp., New York, N. Y., announces the Automatic Products Co. and National Machine Products Co., both of Detroit, Mich., have been licensed to manufacture bolts and nuts, cap screws, set screws and studs threaded with the Dardelet Self-locking Screw Thread.

Chicago Pneumatic Tool Co., New York, N. Y., tells of the formation of the CP Quarter Century Association formed October 1 to include all its present employes and those of its affiliates who have completed 25 years or more of uninterrupted service. There were 75 eligible at that time and their total years of service numbered 2112. A suitably engraved certificate of membership and a specially designed gold pin were presented each member.

General Electric Co., Schenectady, N. Y., announces that the new unemployment relief plan offered employes by the company has been accepted by them. The tabulation of votes showed that 89.9% of its employes eligible to vote had cast their ballots and that 97% of these ballots favored adoption of the plan. The plan provides for rotation of available work at an hourly rate, and employes on the payroll November 1 may be assured of receiving, during the following six months, not less than the equivalent of their average full-time earnings up to an average of $15 per week and actual earnings in case the latter amount is more than $15.

Trade Literature

NOTICE—Any publication mentioned under this heading will be sent free unless otherwise noted, to readers, on request to the firm issuing the publication. When writing for any of the items kindly mention ROCK PRODUCTS.

Rubber Specialties. New edition of the Diamond Rubber Co. mechanical catalog has added driller's hose and X-70 packing. DIAMOND RUBBER CO., INC., Akron, Ohio.

Thickener and Mills. Folder describes features of the Hardinge thickener and explains operation of the conical mill. HARDINGE CO., York, Penn.

Welded Steel Gears. Folder describes Lukenweld gear blanks and how to produce gears from them for best results. LUKENWELD, INC., Coatsville, Penn.

Welding and Cutting Torches. Torchweld catalog gives detailed information on the Non-flash Torchweld line. New items added to this line have been included in this catalog. TORCHWELD EQUIPMENT CO., Chicago, Ill.

Trucks. "Autocars for Construction Hauling" is title of strikingly illustrated book on the use and users of Autocars in the construction industry. An alphabetical list of users is given. THE AUTOCAR CO., Ardmore, Penn.

Fusion Welded Boiler Drums. Folder announces Babcock and Wilcox is prepared to supply all of its boiler drums in accordance with the A. S. M. E. code for fusion welding. BABCOCK AND WILCOX CO., New York, N. Y.

Refractory Cement. Bulletin describes Pyro-Mortar, a dry refractory cement. Advantages of the material are described and details on using are given. Other Quigley refractory materials are listed and described. QUIGLEY CO., INC., New York, N. Y.

Spiral Welded Pipe Coatings. Bulletin describes various coatings available with Armco spiral welded pipe and suggests method of selection, gives probable life when subjected to different chemicals, and other information. AMERICAN ROLLING MILL CO., Middletown, Ohio.

Protective Coatings. Bulletin 1238 illustrates installations where Apexior has been used. The method of application is explained and properties of the material are given. Users in many states are listed. DAMPNEY CO. OF AMERICA, Boston, Mass.

Machine Bases. Folder describes different applications and principle of operation of the U. S. G. sound insulative machine base designed to eliminate vibration from being transmitted by machinery. UNITED STATES GYPSUM CO., Chicago, Ill.

Drillers. September issue of the "Armstrong Driller" contains article by S. R. Russell on "Should Holes Be Single or Double Row." It also describes quarry operation of the Wabash Portland Cement Co. ARMSTRONG MANUFACTURING CO., Waterloo, Ia.

Motors, Turbines, Compressors and Accessory Equipment. GEA-1406 describes explosion-proof totally enclosed, fan-cooled, single-phase motors, type SCR for class 1, group D, hazardous locations; **GEA-137B** describes construction features of low-speed synchronous motors, types TS and QS for direct connection to reciprocating compressors; **GEA-1450** illustrates features and construction of mechanical-drive turbines, type D-58; **GEA-708-B** shows GE "7600 series" synchronous motors from 125 to 600 hp.; **GEA-1437** is a specification sheet for built-in speed reducers for general purpose, ball-bearing G-E induction motors; **GEA-1296A** gives complete information on CR9517 brakes for direct-current motors; **GEA-957B** describes construction of mechanical-drive turbines type D-53, both condensing and non-condensing up to 600 hp.; **GEA-752A** illustrates in detail direct-current motors type BD, both constant and adjustable speed, from ½ to 3 hp.; **GEA-61C** contains information on constant-speed direct-current motors, type CD from 3 to 200 hp.; **GEA-1326A** illustrates totally enclosed, fan-cooled induction motors; **GEA-528A** contains engineering data on centrifugal air compressors; **GEA-1383** illustrates and describes special features of general-purpose squirrel-cage induction motors, type K; **GEA-1412** contains information on type K, solid-shaft vertical induction motors from ½ to 5 hp.; **GEA-1341A** contains information on explosion-proof totally enclosed, fan-cooled induction motors from ¾ to 75 hp.; **GEA-712B** contains specifications and data on adjustable speed, alternating current, brush shifting BTA motors; **GEA-894** illustrates in detail type CD adjustable-speed direct-current motors; **GEA-1335** contains data on alternating-current turbine-generator sets from 10 to 300 kw., and **GEA-1393** gives condensed details of single-stage, centrifugal air compressors. GENERAL ELECTRIC CO., Schenectady, N. Y.

Data on Short-Center Drives

"VIM Short-Center Drives" is the name of a new 148-page belt treatise compiled by the engineering research of E. F. Houghton and Co., Philadelphia, Penn. It is an entirely new treatment of short center drives. The book contains charts, tables, and engineering data on 5,000 standard "Vim" drives ranging from 5 to 100 hp. The book is built entirely around Vim mineral tanned leather belting.

Ball Bearing Data

THE EIGHTH EDITION of the New Departure catalog on ball bearings has been issued by the New Departure Manufacturing Co., Bristol, Conn.

This catalog contains complete data on dimensions, load capacity and prices of single row radial, double row angular contact, Radax single row angular contact, magneto, shielded, N-D seal and front wheel bearings.

Information on selection of bearing size, proper mounting, equivalent sizes and weights and conversion tables is included. The booklet is conveniently indexed to facilitate its use.

Recognized the World Over as the Leader in Its Field

Rock Products

With which is Incorporated CEMENT and ENGINEERING NEWS **Founded 1896**

Entered as second-class matter, July 2, 1907, at the Chicago, Ill., postoffice under the Act of March 3, 1879.

Contents for November 21, 1931

Departments

(Rock Products is indexed in the "Industrial Arts Index," which can be found in any Public Library)

TRADEPRESS PUBLISHING CORPORATION

542 South Dearborn Street, Chicago, Illinois, U. S. A.

N. C. Rockwood, Acting President; C. O. Nelson, Secretary; Irene H. Callender, Treasurer

NATHAN C. ROCKWOOD, *Editor and Manager*
EDMUND SHAW, Los Angeles, Calif., *Contributing Editor*
EARL C. HARSH, WALTER B. LENHART, H. O. HAYES, *Associate Editors*
A. M. STERN, *Assistant Editor*
FRED S. PETERS, *Advertising Manager*
E. A. SINE, *Production Manager*

E. H. PAULL, JOSEPH A. WALSH, *Eastern Representatives*
280 Madison Ave., New York City. Tel. Caledonia 5-4474

GEORGE M. EARNSHAW, *Central Advertising Manager*
2380 Winfield Ave., Rocky River, Ohio. Tel. Boulevard 4353

NORMAN BOGGS, C. L. WALKER, *Western Representatives*
Chicago. Tel. Wabash 3714-3715

SUBSCRIPTION—Two dollars a year to United States and Possessions. $4.25 a year to Canada (including duty) and to foreign countries. Twenty-five cents for single copies

TO SUBSCRIBERS—Date on wrapper indicates issue with which your subscription expires. In writing, to have address changed, give old as well as new address

The A. B. P. is a nonprofit organization whose members have pledged themselves to a working code of a practice which the interests of the men of American industry, trade and professions are placed first—a code demanding unbiased editorial pages, classified and verified paid subscribers, and honest advertising of dependable products. The A.B.C. is an organization which audits and verifies publishers' circulation claims and records.